INSTRUCTIONAL METHODS FOR HUMAN ANATOMY AND CELL BIOLOGY IN NURSE ANESTHESIA GRADUATE PROGRAMS: A SURVEY WITH A FOCUS ON REGIONAL ANESTHESIA

1997

BURNETTE

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INSTRUCTIONAL METHODS FOR HUMAN ANATOMY AND CELL BIOLOGY IN NURSE ANESTHESIA GRADUATE PROGRAMS: A SURVEY WITH A FOCUS ON REGIONAL ANESTHESIA

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ABSTRACT

Advanced anatomy instruction is required in nurse anesthesia programs by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA). This study provides a descriptive analysis on how anatomy is taught in nurse anesthesia programs in the United States with special emphasis on regional anesthesia. A survey consisting of 18 questions regarding anatomy course curriculum and regional anesthesia training was mailed to the nurse anesthesia programs (n=87) accredited by the COA. Supporting evidence for content validity and reliability was obtained. A total of 78 programs (90%) responded to the survey. The majority of programs 49 (63%) teach a specific course in human anatomy with 14 (18%) of those programs teaching a combined anatomy and physiology course. The mean hours spent in lecture was 5 hours per week. More variability in the lab hours existed with a range of 0-20 hours, a mode of 0 hours, and a mean of 2 hours per week. Twenty-two (28%) of the programs use human specimens with 10 (13%) using prosected specimens, 2 (3%) using dissection only, and 10 (13%) using a combination of both. Of the programs using human specimens, 17 (22%) have instructors demonstrate regional anesthetic techniques in situ, and 3 (4%) of the programs afford the students the opportunity to practice regional anesthetic techniques on the specimens. Computer assisted instruction (CAI) is used by 14 (18%) of the programs with many more planning to incorporate this new technique in the near future. With such disparity among programs, a need for further investigation regarding the efficacy of different instructional techniques is warranted.

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by

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DEDICATION

I would like to dedicate this thesis to Brad whose love and support motivated me to finish and to my brother, Jordan, whose computer assistance saved my sanity.

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CHAPTER 1: INTRODUCTION

Background

One of the current areas of interest and concern among members of the American Association of Nurse Anesthetists (AANA) is the education and quality of our graduates (Zambricki, 1996). There are currently 87 accredited programs of nurse anesthesia in the United States. Anesthesia programs are accredited by the Council on Accreditation (COA) of Nurse Anesthesia Educational Programs. This council was developed in 1975 and functions as an autonomous multi-disciplinary body under the corporate structure of the AANA (AANA, 1996). The COA itself is recognized by the United States Department of Education and the Council on Postsecondary Education Accreditation (COPA) as the sole accrediting authority for nurse anesthesia programs. Recognition from these agencies is important because it validates the quality of the educational program (Foster & Jordan, 1994).

In order to be accredited by the COA, schools must meet the criteria outlined in the *Standards for Accreditation of Nurse Anesthesia Educational Programs* (Carroll-Perez, 1996). The minimum requirements for academic course work according to the current standards and guidelines include:

Professional aspects of nurse anesthesia practice--45 hours

Advanced anatomy, physiology, and pathophysiology--135 hours

Chemistry and physics related to anesthesia--45 hours

Advanced pharmacology--90 hours

Principles of anesthesia practice--90 hours

Clinical and literature review conferences--45 hours (Foster & Jordan, 1994).

The number of hours dedicated to anatomy, physiology, and pathophysiology emphasizes the "criticality" of these subjects to the practice of anesthesia. Although all of the requirements are important, this study will focus on the importance of Anatomy and Cell Biology education content in nurse anesthesia programs.

The anesthesia program at the Uniformed Services University of the Health Sciences (USUHS) is a relatively new program with the first class graduating in 1996. The program contains a course in Human Anatomy and Cell Biology (Appendix A) that focuses on anatomy at an advanced nursing level including anatomical terminology, cell biology, and major organ systems. It teaches clinically-oriented human anatomy using lecture, dissection and prosection of human cadavers similar to, but in shorter duration, than the course the medical students receive. It is taught and supervised by a Ph.D. anatomist with ancillary instructors including a biologist, a physiologist, physicians, and nurse anesthetists. Professional help is readily available for students experiencing educational deficiencies.

The course serves as a foundation for more advanced nursing courses in the curriculum but also for clinical practice. It contains clinical correlations on how to perform various regional anesthesia techniques demonstrated by practicing Certified Registered Nurse Anesthetists (CRNAs) using cadavers which are either dissected by students or prosected specimens. The course contains eleven clinical correlation sessions allowing the students to experience the blocks in the actual depths and dimensions of the human body rather than from a book, model, or computer assisted instruction (CAI). The students are able to learn with a hands-on approach through regional dissection with each

student responsible for becoming the "expert" on a particular area of the body and demonstrating it to the class.

The school is unique in that it trains military officers from all branches of the services. Due to the unique requirements of the military, graduating nurse anesthetists are expected to be able to perform more independently than their civilian counterparts, in that they may be assigned to serve in isolated areas or small bases with minimal or no physician support. Certified Registered Nurse anesthetists (CRNAs) that provide anesthesia care in rural hospitals, military institutions, and some private practice situations need to learn skills in administering regional anesthetics because they may be the only anesthesia providers in these settings (Horton, 1993). In fact, in the American Association of Nurse Anesthetists (AANA) survey (Heimler and Schumacher, 1985) it was found that CRNAs employed in government hospitals consistently reported they administered a greater percentage of regional anesthetics than CRNAs working in other types of facilities. For example, 100% of military CRNAs reported they administered spinal and axillary blocks while the average for CRNAs overall was 40.8% and 27% respectively. Forty percent of military CRNAs also reported performing epidural blocks (overall average was 22.2%) and 80% stated they administered Bier blocks as compared to 62.3% overall. It is therefore imperative that these graduates receive a solid foundation for their clinical practice.

Given the importance of anatomy, as evidenced by the number of hours required by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) standards and the unique expectations of Uniformed Services University of the Health Sciences (USUHS) graduates to perform beyond the expectations of their civilian

counterparts, it is imperative that the human anatomy component of the nurse anesthesia program be on the cutting edge of education and technology. To that end, this project will examine the instructional methods of human anatomy at other accredited nurse anesthesia programs.

Anesthesia practice involves knowledge of human anatomy for physical assessment prior to surgery and gives the anesthetist a clearer approach to an upcoming surgical procedure. Furthermore, manipulation of the anatomy during peripheral and central line placement, intubation, and regional and local anesthesia techniques also requires a clear understanding of appropriate anatomy. In order to perform these invasive procedures in a safe and competent manner, it is imperative that the graduating nurse anesthetist have a firm understanding of human anatomy. This is especially important in performing regional anesthesia techniques.

Dr. Gaston Labat was one of the pioneers of regional anesthesia. His book on regional anesthesia techniques and applications (1922) is considered a classic, has been revised several times, and is still in use today as a revised edition by Adriani, (1985). Dr. Labat's book included a foreword by William J. Mayo. Labat's influence as a regional anesthetist at the Mayo Clinic did much for the awareness of this technique of anesthesia. His ideas have continued to be expounded upon for incorporation into modern medical practice. Currently, there are many regional anesthesia books, including two from Dr. David Brown, also from the Mayo Clinic.

Dr. Labat believed that "anatomy is the foundation upon which the entire concept of regional anesthesia is built" (p. 5). He described this correlation throughout his book. Each technical description is preceded by a review of the anatomy of the region. For

example, the bony structures of the vertebral column are used as landmarks for anesthetizing spinal nerves. The shape, length, direction, and position of the spinous process all have technical importance and clinical significance when performing various regional anesthetics, not to mention the anatomy of the spinal cord itself (Adriani, 1985). Nerves must be visually imaged in relation to other anatomical structures so that landmarks may be used to perform the techniques correctly.

Many experts agree it is best for the novice to practice regional anesthesia on a cadaver to become familiar with the relationship of nerves to fixed bony landmarks, arteries, and veins. Studying anatomy in this way shows the student a three dimensional visual image so that when landmarks are palpated the tactile sense can lead to the location of other landmarks and nerves. The anatomy laboratory is an invaluable tool for providing students with the look, feel, and complex three-dimensional assembly of the human structure (Educational Affairs Committee, AACA, 1996). According to Dr. Labat, "Anyone who wishes to be an expert in the art of regional anesthesia must be thoroughly grounded in anatomy, for without such knowledge one cannot be successful in this field of pain relief" (Adriani, 1985, p. 5). The significance of anatomy to the practice of anesthesia is quite obvious. This significance has already been established as evidenced by the amount of anatomy related questions on recent certification exams.

According to the Council on Certification of Nurse Anesthetists (CCNA), approximately 30% of the certification exam is related to anatomy (CCNA, 1996). The CCNA supplies an examination content outline of the various subject areas in each section that will be on the certification exam (Appendix B). This information is taught in variety of ways according to the instructional philosophy of the individual anesthesia

programs. Although the Council on Accreditation (COA) of Nurse Anesthesia Educational Programs determines the criteria each school must meet to be accredited, it does not dictate how this information must be taught. Therefore, distinct differences in how it is taught may set some programs apart from others (Carroll-Perez, 1996). Some programs choose not to have a formal anatomy class and incorporate this information into other classes. Other programs teach a formal anatomy course supplementing teaching with models, prosection and/or dissection of human cadavers or animals, and clinical applications.

Although there have been many studies done on instructional methods in medical school anatomy teaching (Fitzgerald, 1992, Hinrichsen, 1978, Monkhouse, 1992, Nnodim, 1990, Pabst, 1993), there have been no similar studies examining the instruction of nurse anesthesia students in human anatomy. Final year medical students just before graduation ranked gross anatomy with the dissection course and integrated clinical topics as a keystone for their clinical practice (Pabst 1993). Nurse anesthetists perform procedures identical to their medical counterparts in anesthesia. It therefore seems logical that the nurse anesthetist must also have a solid anatomical base to provide the best anesthesia possible.

Statement of the Problem

Nurse Anesthetists manipulate the human anatomy on a daily basis as part of their practice. Their knowledge of human anatomy is crucial to safe anesthesia practice. Although there have been numerous studies dealing with medical school anatomy curriculum, there have been no such studies done for nurse anesthesia programs. As

anatomy is a required part of nurse anesthesia curriculum, it is important to examine how it is being taught and whether these methods are effective.

Purpose of the Study

The purpose of this study is to describe how human anatomy and cell biology information including the incorporation of regional anesthesia training is taught in nurse anesthesia programs. This will provide a database to elucidate the depth, breadth and scope of human anatomy instruction in nurse anesthesia programs in the United States and also to provide support for the necessity of anatomy courses in nurse anesthesia training in the future. It will also enable a comparison of how Human Anatomy and Cell Biology is taught at the Uniformed Services University of the Health Sciences (USUHS). The information will also be used to query whether one instructional method is superior for the graduating nurse anesthetists knowledge base of human anatomy as well as the performance of regional anesthesia techniques involving anatomy.

Statement of Research Questions

In an attempt to establish how the accredited nurse anesthesia schools teach anatomy and incorporate regional anesthesia training, this study seeks to answer the following questions:

1. How many of the currently accredited nurse anesthesia programs teach a specific course in Human Anatomy in their graduate programs?

2. What are the instructional methodologies of the Anatomy courses at the various schools? What percentage use dissection, prosection, clinical correlation?

3. Do student nurse anesthetists have the opportunity to see procedures such as regional blocks performed on cadavers prior to entering the clinical setting?

4. Do the students have the opportunity to practice these same procedures on the cadavers?

5. Are Human Anatomy courses in nurse anesthesia programs using Computer Assisted Instruction (CAI) to instruct students in regional anesthesia techniques and if so, which blocks are being demonstrated?

Definition of Terms

American Association of Nurse Anesthetists (AANA): The professional association of Certified Registered Nurse Anesthetists. The philosophy of the professional organization is that the members are dedicated and committed to the advancement of educational standards and practices, which will advance the art and science of anesthesiology and thereby support and enhance quality patient care (AANA Bylaws, 1987).

Anatomy: "the science of the structure and function of the body" (Moore, 1992, p. 1).

Cadaver: corpse or "dead body" used as an anatomical specimen for medical instruction.

Certified Registered Nurse Anesthetist (CRNA): A registered nurse who is educationally prepared and competent to engage in the practice of nurse anesthesiology, responsible and accountable for individual professional practice, and capable of exercising independent judgment within their scope of practice (Foster & Jordan, 1994).

Clinical Anatomy: applying the structural aspects of human biology to better understand the function and dysfunction of the human body, with special emphasis on structure and function as it relates to the practice of medicine and the other health

sciences. It requires an understanding of the anatomy of the entire human body and the ability to apply this knowledge to solve clinical problems (Educational Affairs Committee, AACA, 1996).

Computer Assisted Instruction (CAI): The use of a computer program to simulate a three dimensional approach to procedures such as regional blocks.

Council on Accreditation (COA): The accreditation agency for all Educational Programs of Anesthesia for nurse anesthetists in the United States (Wiseman, 1990).

Council on Certification of Nurse Anesthetists (CCNA): The certification agency for all graduates of Educational Programs of Nurse Anesthesia in the United States. This agency formulates and adopts requirements, guidelines, and prerequisites for certification and eligibility to take the certification examination. The CCNA grants initial certification to those candidates who successfully complete the certification examination formulated by the Council. (Wiseman, 1990).

Council on Postsecondary Education Accreditation (COPA): A national, nonprofit, nongovernmental agency dedicated to the improvement of postsecondary education in the United States through voluntary accreditation. This council reviews the accreditation practices of schools desiring recognition by COPA through periodic review. (Wiseman, 1990).

Dissection: To separate tissues and parts of a cadaver (corpse) or an organ for anatomical study (Tortora, 1983).

Prosection: A previously dissected cadaver, preserved and used for examination and instruction.

Regional Anatomy: Anatomy that deals with a specific region of the body such as the head, neck, thorax, or spinal column. (Tortora, 1983).

Regional Anesthesia (regional blocks): The loss of sensation and temporary relief of pain that is obtained by interrupting the conductivity of sensory nerve fibers in various regions of the body. This is accomplished by direct application of a drug or a combination of drugs to a nerve or nerve bundle. Regional anesthesia includes six different methods of blocking nerve conduction. They are named according to their anatomic sites of injection or application of a drug and include the subarachnoid block, epidural block, nerve block, field block, infiltration, and topical block (Adriani, 1985).

Significance of the Study

There is a significant lack of information regarding teaching of human anatomy to nurse anesthesia students. This study will provide the first practical information to nurse anesthesia educators related to the instruction of human anatomy. It will also provide a data base for the Council on Accreditation of Nurse Anesthesia Educational Programs (COA), allowing for possible recommendations for requiring a core course specific to anatomy to optimally prepare nurse anesthetists for practice. Further, this study will provide information on the relationship of having anatomy training with cadavers and the preparedness of students to perform regional anesthesia.

Assumptions

This research assumes that variability exists in the anatomy instruction and regional anesthesia training provided at the various accredited anesthesia schools in the United States.

Limitations

1. The study will be limited to those programs in the United States which meet COA Standards and Guidelines.

2. The study will also be limited by the number of schools willing to participate and the manner in which the survey population responds to the questionnaire.

3. Inherent limitations of a descriptive study must also be considered.

Summary

Human Anatomy instruction is a required part of nurse anesthesia programs as is dictated by the COA guidelines. The knowledge of anatomy is vital to many procedures in anesthesia, especially regional anesthesia techniques. Although there are many studies involving the teaching of anatomy in medical school curricula, there are no such studies in nurse anesthesia programs. The nurse anesthesia program at the Uniformed Services University of the Health Sciences (USUHS) is a unique program in that it trains military officers. As these officers will at many times be required to work in remote locations with minimal or no physician support and also perform many regional anesthesia techniques, it is imperative that the anatomy program at USUHS remain on the cutting edge. This project will be the first step in examining how anatomy is taught in the various anesthesia schools with special emphasis on regional anesthesia .

CHAPTER 2: REVIEW OF RELEVANT LITERATURE

This chapter presents a review of relevant literature related to anatomy and regional anesthesia. An introductory historical review of anatomy is followed by a review of anatomy training in the medical school and health science curricula, studies relevant to nurse anesthesia programs and concludes with a brief history of regional anesthesia and present regional anesthesia training.

Historical Review of Anatomy

Human anatomy has been an area of fascination and study for centuries. Physicians and scientists through the millennia have been involved in the evolution of the study of anatomy to where it is today. It is therefore not the intention of this section to provide a comprehensive review, but rather highlight a few of the important contributors to this fascinating science.

The oldest known anatomical document, the Ebers Papryrus (c. 1600 B. C.) described treatments for diseases and included many anatomical terms and references to the human body. The descriptions, written in hieratic characters, were primitive and often inaccurate, but the vital link between structure, function, and medical practice was clearly recognized (Educational Affairs Committee, AACA, 1996). The oldest known surgical document, the Edwin Smith Surgical Papyrus, was written in the seventeenth century B.C. and contains the earliest reference to the brain anywhere in human records (Breasted, 1930).

Hippocrates (460-370 B.C.) is best known for being the "Father of Medicine", the first physician to separate medicine from philosophy. Physicians still practice under the

Hippocratic oath to this day. His contribution to anatomy is recognized, but relatively short compared to his other accomplishments. Although his explanations of many organ systems were accurate, his explanations of areas like the brain and circulation were inadequate and his conception of the circulation incorrect (Major, 1954). There is no evidence that Hippocrates ever dissected the human body, and it is extremely doubtful given the reverence the Greeks of that time held for the human body.

Herophilos of Chalcedon (c. 300 B. C.), the "Father of Anatomy" was the first to dissect both human and animal bodies. His impressive contributions include describing the brain in great detail including describing it as the center of the nervous system, differentiating the nerves from the tendons, and dividing nerves into sensory and motor.

Galen in 164 A. D. did most of his work on apes, hogs, and other animals, although he also dissected the human body. His anatomy was authoritative for nearly 1500 years. His contributions were many and much of his work especially on the muscles and bones is still employed in anatomical textbooks. He also did extensive work on the nervous system distinguishing between motor and sensory nerves and describing the physiological effects of sectioning the spinal cord at various levels. He proved that cutting the recurrent laryngeal nerve caused loss of voice, and that word memory may be lost through cranial nerve injury. Although Galen's contributions were remarkable, there were still many errors such as describing the liver with five lobes and the venous system arising from the liver which his followers would teach for centuries to come. After Galen's time, dissection was largely abandoned, as many physicians believed it was unnecessary "since Galen knew all things anatomical and had described them in his books" (p. 195).

It was not until 1542 that anyone seriously questioned Galen's anatomical authority. Andrea Vesalius of Brussels (1514-1564) was interested in anatomy from a young age and dissected mice, rats, dogs and cats even as a youth. He studied medicine in Paris under Jacobus Sylvius and Johann Guinterius, both eminent teachers and followers of Galenic anatomy. Vesalius disagreed with many details of Galenic anatomy and after his studies went to Padua where he was appointed to the chair of anatomy and surgery in the university (Saunders & O'Mally, 1950). At Padua he used cadavers (stealing them when necessary) for his public demonstrations of anatomy dissection and instruction. In his courses in anatomy he cleared away many of the errors of Galenic anatomy and was criticized by many for suggesting such a thing (Lind, 1949). Vesalius addressed many of his critics stating,

> I hear that many are hostile to me because I have held in contempt the authority Galen, prince of physicians and preceptor of all; because I have not indiscriminately accepted all his opinions; and, in short, because I have demonstrated that some fault is actually discernible in his books. Surely, scant justice to me and to our studies, and, indeed, to our generation! (Saunders & O'Mally, 1950, p. 13).

The greatness of Vesalius was in his refusal to blindly accept the knowledge of his predecessors. He never completely opposed the Galenical system and praised his work, but also attempted to reconcile or correct the anatomical descriptions of Galen whenever they were in disagreement with observation (Lind, 1949).

In 1543 when he was 28 years old, Vesalius' most famous books *De Humani Corporis Fabrica Libri Septem* and *The Epitome* were published and mark the beginning

of modern science. He has been praised as "the founder of human anatomy" and "the first modern anatomist to place his study on a firm foundation of observation". His methods exploded the field of anatomy and many people to follow him over the centuries would expand on his findings. His descriptions and illustrations are still used in anatomy courses today. Modern science owes the very foundation upon which it has erected the theory and practice of present-day anatomy to Vesalius.

The method of teaching anatomy using human cadavers for instruction is still used in anatomy labs today. It is the foundation of our knowledge of anatomy and is the best means we have for reaching our main objective of acquiring knowledge of the structure of the living body (Moore, 1992). In 1763, Claude Nicholas Le Cat, Chief Surgeon and Professor of Anatomy and Surgery of the Hotel-Dieu of Rouen, France had this to say to his students:

> It is at last evident that there is no better use for the dead than the instruction of the living...Never forget the dangers that may attend the operations you venture on without a thorough study of Anatomic Science. Be diffident, fear your inadequacy, never undertake an operation, engage in nothing without a knowledge of Anatomy. May these truths never quit your mind; may they always be present to you, and stimulate you to apply yourselves increasingly to the study of this science. (Dahan, 1993, p. 254).

The importance of studying human anatomy has been proven throughout the millennia. The ability to think about anatomy in functional terms is essential for the practice of medicine, a fact that remains unchanged since it was first documented over 3,000 years ago (Educational Affairs Committee, AACA, 1996).

Anatomy in the Medical School Curriculum

As anatomy has been a requirement for the study of modern medicine since it's conception during the Renaissance, it is not surprising that the predominance of articles concerning teaching human anatomy have focused on medical education. The course has been examined over and over for its relevance to medical practice and the methodologies in which this information can best be presented. The major emphasis of these articles is related to adopting time-saving and cost-containment measures in regard to laboratory cadaver dissection, as well as making the anatomy courses more clinically oriented. These issues have not only been studied in the United States, but virtually in all countries who train physicians.

In 1978, anatomy teaching in Britain, France, Germany, the Netherlands, and South Australia. was presented and published in abstract form at the proceedings of the Anatomical Society of Great Britain and Ireland. Each country described their methodology for teaching anatomy including the number of hours in their programs and use of dissection and prosection (and number of students to each cadaver). Each program was described in detail with recommendations for improvement, but programs were not compared to one another. Overall themes included the fact that all centers still employed dissection as an essential part of anatomy teaching. Extensive use was also made of prepared specimens including plastic-embedded preparations and models and other audiovisual aids (Hinrichsen, 1978). Concern about the inadequacy of anatomical knowledge at the time of graduation for effective clinical practice, also spurred some universities to introduce post-graduate training programs in anatomy for recent graduates (Coupland, 1978). Emphasis was placed on the fact that anatomy training teaches a large

proportion of the medical vocabulary essential for accurate communication between practitioners and that the essential difference between a competent and incompetent medical practitioner is a sound knowledge of clinically relevant anatomy.

Many studies since this time have discussed various aspects of anatomy training. Nnodim (1990) did a study in which two matched groups of first-year preclinical medical students studied gross anatomy, one using traditional dissection and the other using only prosected cadavers. His results indicated that at the end of the course the prosection group performed better than the traditional group and that the difference was statistically significant ($p < .05$). He concluded that working with prosections was an effective way of learning human gross anatomy especially to combat unfavorable student to cadaver ratios and curtailed teaching time.

His study was followed by a survey by Fitzgerald (1992) that was sent to the membership of the Anatomical Society of Great Britain and Ireland soliciting opinions about optimal teaching and learning arrangements with respect to gross anatomy. The main area of debate was once again dissection versus no dissection. Of the 62 respondents, two-thirds advocated more or less complete dissection, while one-third advocated little or none. The top reasons given for dissection included cultivation of a three-dimensional sense of anatomical relationships, active participation in the learning process, teaching manual dexterity, and a better recall of facts at later points in time. The advocates of little or no dissection stated efficiency, more time for study of completed dissections, and a similar recall of facts later in time as top reasons for their position. Despite the results of Nnodim's 1990 results, this topic is still one of great debate.

The study also includes the optimal linkage of anatomy teaching to clinical teaching. The majority of the respondents (59) wanted clinicians to give illustrated talks to the students, while only 28 respondents wanted participation of anatomists in the clinical program. This was the focus of an article written by Monkhouse that same year. He asked: who cares how many hours are spent on the course, the methods used, or what the staff/student ratios are if the students learn anatomy that is irrelevant to clinical practice (Monkhouse 1992)? He stated that the teaching of clinical skills should begin in the dissection room from the very beginning. He stated that his opinion is that a combination of anatomists to teach the proper anatomy and medically qualified staff to teach clinical relevance is the most effective teaching method. The views of a medically qualified teacher would be different than a non-medically qualified teacher, and the combination is needed to provide the best clinically oriented anatomy for the students. He also suggested a well-directed and clinically oriented anatomy course early in medical training, with relevant clinical sessions throughout the training for refreshment and reinforcement. For example, when students are doing their cardiology rotation, they would get refresher instruction on clinical anatomy of the heart and vasculature.

This idea correlates well with a study completed by Pabst in 1993. He sent a questionnaire to medical students in their final year discussing the gross anatomy they had experienced in their curriculum. They were asked to evaluate the relevance of the dissection course, lectures and seminars in gross anatomy for clinical courses, as well as its application to their practice on the wards. The vast majority would have liked to have repeated anatomy during the clinical curriculum and approximately 75% of all students expressed an interest in specialized, short dissection courses during the later clinical

phase (for example, dissecting joints and the vertebral column again if they planned to become orthopedic surgeons). The students at the time of graduation ranked clinical relevance very high. Approximately 20% of the students asked for more clinically oriented topics as a suggestion for improvement.

The results of this survey support the argument by Monkhouse (1992) for anatomy relevant to the medical profession. The involvement of clinicians in supplying relevance has been important in motivating medical students to learn the multitude of facts in anatomy. The students realized that the intensive time spent in anatomy was necessary. In fact, they ranked gross anatomy with the dissection course and integrated clinical topics as a keystone for their clinical courses and future practice (Pabst, 1993).

As medical anatomy education moves into the 21st century, clinical relevance will continue to be an important player. Anatomic principles underlie every clinical activity. Therefore, the clinical anatomist must make every effort to have contact with, or direct access to, the clinician to work together as a team (Putz, 1993). A three-dimensional appreciation of human anatomy is the cornerstone of clinical anatomy and the foundation on which the ability to perform numerous procedures depends. Many educators suggest that incorporating common clinical procedures into a gross anatomy curriculum will be the wave of the future (Educational Affairs Committee, AACA, 1996).

Human Anatomy is so important to the foundation of clinical medicine that the Educational Affairs Committee of the American Association of Clinical Anatomists (AACA) provides guidelines to decision-makers involved in clinical anatomy curriculum development at the medical school level. The most recent document highlights clinical anatomy curriculum for the medical student of the 21st century and has three principle

editors, Marks, Cahill, and Scothorne (1996). The main body of the document sets forth the anatomical concepts and subject matter a student should master prior to graduation from medical school. "The AACA seeks to ensure that all medical students receive thorough training in clinical anatomy and that each student, regardless of the institution attended, will be exposed to a curriculum that will provide a fundamental level of competence required for the practice of medicine" (p. 71). This type of guidance could also be adjusted to apply to other health care professions requiring anatomy training such as nurse anesthesia.

Anatomy in other Health Science Curriculums

Although the literature on anatomy training in medical schools is quite extensive, the information from other health science curricula is extremely limited. The information on the teaching of anatomy in undergraduate nursing programs is scarce. Griffiths, Bevil, O'Conner, and Wieland (1995) examined Anatomy and Physiology as a predictor of success in undergraduate nursing students. They concluded that students who did well in this course tended to perform better in nursing school overall, indicating the importance of Anatomy and Physiology in building a solid foundation for subsequent courses.

However, a significant study was performed by Mattingly & Barnes (1994) describing how human anatomy was being taught in physical therapy programs in the United States. The purpose of their study was to determine how human anatomy was being taught in physical therapy programs after determining there was a significant lack of information in this area. Their survey of existing physical therapy programs included requests for information about instructor qualifications and faculty appointments, student numbers and ratios, curricular sequence and time allotted for the teaching of human

anatomy, laboratory resources and activities, anatomy instructional activities, and course content.

These researchers reported that dissection remained the primary teaching method in the physical therapy programs surveyed. They also documented the use of prosected specimens, various audiovisuals, and computer-assisted instruction. An average of 8.1 hours per week were devoted to laboratory instruction with a faculty-student ratio of 1:16 and a student cadaver ration of 5:1. They also described the academic degrees held by the instructors with 50% of those teaching anatomy having a degree in physical therapy, and 65.6% of the instructors being doctorally prepared. They found that differences existed between the teaching methods of physical therapy versus non-physical therapy instructors with respect to course content and clinical applicability. They also found that a variety of different textbooks were used, with the value placed on clinical applicability as a major consideration.

The importance of anatomy as a foundation of physical therapy programs was recognized and a data base of how the information was taught was obtained. This allowed the physical therapy programs to re-evaluate their teaching methods to teach the information needed for clinical practice most effectively.

Similar information is necessary for the anatomy instruction of nurse anesthesia students. Many of the same questions from this study will be asked of the anatomy coordinators of the various anesthesia schools with an added emphasis on clinical correlation with regional anesthesia.

Studies Relevant to Nurse Anesthesia Programs

The last 20 years has been filled with changes in nurse anesthesia education. Educational standards and guidelines in 1976 were specifically designed and approved to upgrade the education of nurse anesthetists and bring more formalization to the educational process (Gunn, 1991). Since then things have changed significantly. Specific guidelines are now established by the Council on Accreditation (COA) on what academic subjects must be taught and for how many hours (Foster & Jordan, 1994). A majority of accredited nurse anesthesia educational programs are now in a graduate framework, with a goal of having all programs offer a graduate degree by 1998 (Gunn, 1991). With these changes have come a variety of studies comparing anesthesia programs and experiences, with the hope of continual improvement of the education process.

The military has been in the forefront of many of these changes. Byrnes (1991) described the Navy program consisting of two unrelated phases of education (academic and clinical) with advantages and disadvantages described. Students spend the academic and didactic portion strictly in a university setting, and the clinical portion in a hospital setting. This type of regionalized training is now being incorporated into many programs, including the Uniformed Services University.

Some studies have focused more on curriculum. Although many studies have examined the nurse anesthesia curriculum in general, no specific courses such as Anatomy and Cell Biology have been highlighted. Wiseman (1990) identified and analyzed variables of admission, curricula, and graduation requirements among 75 nurse anesthesia programs. Her purpose was to examine similarities and dissimilarities among

nurse anesthesia educational programs to provide practical information to nurse anesthesia educators and expose educational trends.

Carroll-Perez (1996) studied whether a relationship exists between various characteristics of nurse anesthesia schools and their success rate on the national certification examination. Variables examined included students per class, number of clinical rotation sites, program length, type of degree or certificate granted, program structure, and date of graduation. No statistically significant relationship was found between any of the variables studied .

Other studies have concentrated more on clinical experiences. Welty & Murray (1993) reported the findings of the 1990 and 1992 student nurse anesthetist survey in which a first and second year student were selected from each accredited anesthesia program to complete the survey. The respondents to the survey consisted of 52 first -year students and 48 second-year students in 1990 and 50 first-year and 56 second-year students in 1992. Questions included what types of regional anesthesia the students administered, student performance of different techniques of intubation, student placement of invasive lines, and student perception of their overall clinical experiences. The regional anesthesia questions inquired about the actual administration of subarachnoid blocks, epidurals, and peripheral nerve blocks. The results showed little difference between first and second year students or between the two years (1990 and 1992). Interestingly in this study it was noted that many of the students questioned never had the opportunity to perform regional anesthesia techniques while in school.

A similar study by Horton & Jordan (1994) examined various aspects of the 94 nurse anesthesia programs existing at that time. Areas investigated included the degree

awarded at the various schools, length of the program, required prerequisite courses, most frequent clinical affiliation sought to enhance clinical experience, number of mask cases, and actual administration of regional anesthesia. Out of the 94 schools questioned, 83 programs (88%) offered their students experience in actual administration of subarachnoid blocks, 75 (80%) epidural blocks, 89 (95%) Bier blocks, 68 (72%) axillary blocks, and 7 (7%) retrobulbar blocks. This data is important because it assists in monitoring trends in education that affect practice.

Although the previous studies did discuss student administration of regional anesthesia, the purpose of the study was to collect numbers on how many of the various techniques are being done. There has not been a study done on how the students are taught regional anesthesia at the various schools, or on how it relates to anatomy training.

Regional Anesthesia

Regional anesthesia, as it is known today, is a relatively new science dating back to the introduction of cocaine in 1883 (Adriani, 1985). The first recorded case of regional anesthesia was in 1884 when Dr. Carl Koller discovered the local anesthetic effects of cocaine in his ophthalmic practice using it to apply topically to the eye (Duncum, 1947). A year later, Dr. William Halsted operated on the brachial plexus by blocking its roots in the patient's neck with cocaine. That same year, Dr. Leonard Corning, a neurologist, was the first to produce lumbar anesthesia by injecting cocaine extradurally. It was more than 10 years later, in 1898, that Dr. August Bier established spinal anesthesia into practice by the injection of cocaine into the subarachnoid space of a patient undergoing a foot amputation (Stoelting & Miller, 1994).

Although cocaine was an adequate anesthetic, it had many undesirable side effects that included cardiovascular complications. In order to avoid these complications, Procaine was synthesized by Dr. Einhorn in 1905, and it essentially replaced cocaine for producing regional anesthesia. Today, there are many local anesthetic choices. The most frequently used are tetracaine, lidocaine and bupivacaine. Regardless of the agent used, regional anesthesia continues to be an important part of modern anesthesia practice.

Although general anesthesia continues to be the most frequently performed type of anesthesia for most surgical procedures, the number of operations performed with regional anesthesia has increased considerably. Regional anesthesia can offer many advantages over general anesthesia including postoperative pain relief with subsequent improvement in oxygenation; minimal interference with laryngeal reflexes, respiration and cough ability; good peripheral blood flow and antithrombotic effect; and a diminished stress response to surgery (McAuliffe, 1991). Despite the evidence that regional anesthesia has so many advantages, and that it is preferred for many patients in a variety of surgical and obstetrical procedures, many accredited nurse anesthesia schools still do not require that regional anesthesia be taught in their programs (Horton, 1993).

Horton (1993) performed a study to identify the number of nurse anesthesia programs that were training their students in regional anesthesia techniques. In this study, she wanted to identify reasons why administration of regional anesthesia should or should not be a required educational experience, and what support for, or obstacles to, this experience were present. Administration of regional anesthesia is strongly encouraged, but is not a requirement in accredited nurse anesthesia programs. She discovered that most, but not all, of the accredited programs offered students experiences

in administering at least some type of regional anesthesia and provided a table of the different blocks performed. She found that students at the 92 nurse anesthesia programs at that time administered subarachnoid (spinal) anesthesia in 80 (87%) of the programs, epidural in 73 (79%), axillary (brachial plexus) in 60 (65%) of the programs, Bier blocks in 82 (89%), retrobulbar blocks in 5 (5%) and other (caudals, pain management, topical, local infiltration, and extremities) 26 (28%).

Sixty-six percent of directors of the various programs when asked whether there should be an accreditation requirement for administration of regional anesthesia responded "yes". A representative statement for the support of performing regional anesthesia in the accredited programs was:

> CRNAs function as sole anesthesia providers in many settings; current standards of practice and concerns for quality of care dictate that many patients receive regional anesthesia as the safest, best technique of choice; therefore to meet the demands of current practice and assure citizens have appropriate access to quality care, CRNAs should be proficient in regional anesthesia (p.500).

A CRNA's educational preparation should not restrict them from performing the type of anesthesia that will be in the best interest of their patient. The data in this study provides information about whether or not the blocks are performed and recommendations about the need to teach regional anesthesia to students, but does not provide information on how the students are instructed in the technique of regional anesthesia.

Although there have been countless excellent articles on how to perform various regional techniques (Kopacz, 1995, Pugh, 1993, Purdham, 1992), there is no literature

available on how the various anesthesia programs teach regional anesthesia and whether or not their methods are effective. According to Gail Holiday, member of the Council on Accreditation of Nurse Anesthesia Educational Programs (COA), approximately ten percent of accredited schools still do not have the opportunity to practice regional anesthesia techniques (G. Holiday, personal communication, May 7, 1997). Since the accreditation mandate will be that all nurse anesthesia students experience actual administration of regional anesthetics by the year 2000, it is imperative that information on how regional anesthesia is taught be obtained. The goal of this study is to establish a database for this information especially as it relates to anatomy training and the preparedness to perform regional anesthesia.

Summary

The literature is full of information regarding of the importance of Human Anatomy education and the study of medicine since the beginning of the science of medicine itself. Study after study has been done to determine the best way to present this information to the physicians of the future. More recently studies have been accomplished in other health science curricula, to determine the teaching effectiveness of this valuable science.

Although many studies have been done in nurse anesthesia programs examining the education and educational process of their students, none have examined the Human Anatomy education that nurse anesthesia students receive. Human Anatomy knowledge is integral to the practice of anesthesia, especially when performing regional anesthesia techniques. As nurse anesthetists will be performing these techniques in the same fashion as their physician counterparts, it is imperative that they receive a quality education in

Human Anatomy. This study will examine that education in the hopes of improving this process for the nurse anesthetists of the future.

CHAPTER 3: CONCEPTUAL FRAMEWORK

Understanding how students learn best is widely regarded as important, but continues to receive little ongoing and explicit attention from educators and their institutions. There is often a fatalism about learning, either one learns or one does not (Sims & Sims, 1995). This is especially true for the adult learner. Many educators assume by this time the student should know what works and how to get the job done. Malcolm Knowles (1984) who is well known for his theory on adult learning, states that adults will learn "no matter what." He summizes that learning is as natural as rest or play and with or without books, visual aids, inspiring teachers, or classrooms, adults will manage to learn (Sims & Sims, 1995). Although it is true that adult learners are usually more self motivated and are expected to learn and apply their learning without much prodding, instructors can reap better results by understanding and applying certain principles of learning when designing and implementing their programs.

In order for instructors to use techniques that will be of the greatest benefit to their adult learners, it is first necessary to apply some of the concepts of adult learning. According to Knowles (1984), experience is the richest resource for adult learning. It involves active participation in planned experiences, the analysis of those experiences, and their application to situations. These same principles flow through the theory of experiential learning which has evolved from being an exploratory, experimental technique in the 1950's and 1960's, to being common practice wherever learning is pursued (Walter & Marks, 1981).

Experiential learning is defined as a "sequence of events with one or more identified learning objectives, requiring active involvement by participants at one or more points in the sequence" (p. 1). It is operative when participants are fully involved, the lessons are clearly relevant, the individuals develop a sense of responsibility for their own learning, and the learning environment is flexible. Walter and Marks describe the aspects of experiential learning (involvement, relevance, responsibility, and flexibility) in the following manner.

Involvement results from actually engaging in an activity. It influences attitude change and growth as well as skill development. An excellent example involves learning how to drive a car. People do not simply sit through lectures and read the manual on how to drive. Although this is important, they eventually have to get behind the driver's wheel and *do it*. The same concept applies in the armed forces where experience based training is used to get troops ready for the discomfort, depersonalization, and stress of combat. The soldiers are actually put through simulated war scenarios with the idea that the troops will learn and be able to adapt more readily to the real situation than if they simply read a handbook. This is an important concept of the learning process. Direct experience can be very effective in motivating students to learn and can have a riveting effect on their memory (Cotton, 1995).

Involvement is not the only aspect of experiential learning. A topic must also have *relevance*. The students must see the information as relevant to their learning needs. Insights are also gained through the interpersonal exchange involved in addressing a topic such as in small groups. Since relationships are a central component of everyone's life, participant's consistently express an appreciation of this element in the learning process

(Walter & Marks, 1981). Working together promotes camaraderie, a sense of striving together for a common goal, and a sense of participation in the learning process. This type of learning allows for more ownership in the learning than does a lecture only type environment.

Experiential learning also promotes participant *responsibility* and is *flexible* in its uses. Students are responsible for their learning in that they must choose the amount of energy to invest and how to respond to certain activities. A sense of "one gets out what one puts in" is more apparent in this type of learning environment. Students have the opportunity to become committed and gain a real sense of responsibility for the success of their learning experience. The flexible approach of experiential learning adapts to the situation depending on the type of learner and what is to be learned. Settings can include preschools, churches, business, industry and universities.

Experiential learning is ideal for the university education especially for skill oriented professions and subjects in which visualization is important. One such course is that of graduate level Human Anatomy in a Nurse Anesthesia Program. Nurse Anesthetists manipulate the human anatomy on a daily basis as part of their practice. Their knowledge of this subject is crucial to safe anesthesia for procedures like airway management and intubation, placement of peripheral and central venous access and performance of regional anesthesia techniques.

This is where the involvement of experiential learning becomes important. Although it is possible to learn through books, models and demonstrations on live humans, the ability to look and feel in a three dimensional fashion is not possible. No other method approximates the true topographical anatomy as closely as can inspection,

palpation, and dissection of the cadaver (Newell, 1995). Dissection trains the student in spatial appreciation and orientation and encourages both self-directed and directed learning, the use of teamwork, and small-group personal interaction with student colleagues and instructors. The students feel involved and responsible for their dissection and their learning process.

Visualization allows the student to have a three-dimensional picture in their mind. This is especially important in regional anesthesia where a confident understanding of the human anatomy is essential to performing regional anesthesia effectively. Allowing students to practice techniques like regional anesthesia on the cadavers enhances the experience even more. The relevance of the class is apparent by the direct application of the subject to the student's new profession which enhances both commitment and memory. By definition, education must go beyond the mere imparting of facts as is found in many courses (Chipas, 1995). It must aid in understanding as well as facilitate the student's ability to synthesize information and apply it to clinical situations. The opportunity to visualize a human cadaver and to see and/or perform procedures on that cadaver allow for a multidimensional skills acquisition that can not be acquired from a textbook.

CHAPTER 4: METHODOLOGY

This chapter outlines the methods used to implement this descriptive, exploratory study. It addresses the research design, sample selection, and instrumentation including questionnaire development, content validity and test-retest reliability.

Research Design

The research design of this study was descriptive and was used to explore how the various anesthesia programs teach anatomy. Focus was on regional anesthesia exploring how this information was taught at the various programs. This data can be used in future studies to determine if the methodology makes a difference in the ability to perform various regional anesthesia techniques.

Sample

The sample of this descriptive study consisted of all Educational Programs of Nurse Anesthesia recognized by the Council on Accreditation (COA). The most recent list published (AANA, 1996) was used to identify 90 schools accredited by the COA. A letter indicating the intent to perform the study and to identify the contact person for Anatomy and Cell Biology was sent to all accredited programs with a response rate of approximately 50% (Appendix C).

The other contact people were identified using the director of the program as the point of contact. At the time the surveys were sent three of these programs were closed leaving a sample size of 87 accredited programs from 34 states including Puerto Rico. Approval for the study was obtained from the Institutional Review Board (IRB) at the Uniformed Services University of the Health Sciences (Appendix H).

Instrumentation

As a thorough review of the literature revealed this type of study had not been done previously in anesthesia schools; the instrument, a questionnaire, was developed involving several steps to establish reliability and credibility.

First, telephone interviews were performed with the contact person from ten of the programs polling them informally as the questionnaire was being developed. The intent of the interview was to assure the comprehensiveness and relevance of the questionnaire to anatomy training and regional anesthesia in the anesthesia programs. Secondly, based on the content analysis of the interviews, any missing content or modification of content was incorporated into the revised questionnaire.

Further content validity of the questionnaire was obtained by requesting two experts practicing anesthesia (one master's and one doctorally prepared and not involved in the initial development of the questionnaire) to rate the degree of relevance of the items to the objective of the questionnaire. Utilizing the evaluation sheet, these experts evaluated the degree of relevance of each item of the questionnaire to the purpose of the study using a "1" to "4" rating the scale. The number "1" represented an item to be not relevant, "2" somewhat relevant, "3" relevant, and "4" very relevant (Appendix D). Both experts were actively practicing in the field of anesthesia as well as in the education of anesthesia students and rated all items of the questionnaire as very relevant. A Content Validity Index (CVI) score of 1.0 was calculated based on the ratings of the two experts and therefore, the tool was left unchanged.

Once the content validity was obtained the questionnaire was administered to 23 randomly selected programs with the expectation that 10 would respond representing

approximately 10% of the total number of accredited programs (Appendix E). The first 10 respondents were chosen and the identical survey was sent two weeks after the initial survey was received to establish test-retest reliability (Appendix F). A 70% return rate of the second surveys was obtained and a percent agreement between the subjects individual responses on the two testing occasions was calculated. An average of 93% agreement was obtained. Most of the disagreement between the test-retest came from being one number off (circling "2" rather than "3" on the Likert scale questions), varying the time spent on individual blocks from 5-30 minutes, and failing to complete questions either the first or second time.

One question did have fairly consistent disparity among the respondents and was reclarified for the final survey. Due to the high percent agreement on the test-retest no other changes were made. Because the changes to the original survey were so minimal (clarifying items only), the original returned survey of the initial respondents was saved for incorporation into the final data. The second surveys were used for test-retest information only and were not incorporated into the final data.

The final questionnaire consisted of 18 questions relating to anatomy and regional anesthesia education (Appendix G). A cover letter explaining the study (Appendix E) as well as a stamped self-addressed envelope for return purposes accompanied each questionnaire. An identification number was placed in the top right corner of each questionnaire for data entering purposes and follow up of unreturned questionnaires. Although this investigator knew which questionnaire was from which program, the programs were assured they would not be singled out by name in the results in order to

maintain confidentiality. The questionnaire was then distributed to the remaining programs.

Every attempt was made to include all programs for thorough data representation. Programs whose responses were not received were called and in some cases questionnaires resent. A total of 78 schools (90%) from 34 states (100%) responded to the questionnaire. Each item of the questionnaire was coded and the data was entered into a computer for analyzation via the Statistical Package for the Social Sciences (SPSS) Software Program.

CHAPTER 5: DATA ANALYSIS

This chapter presents a description of the data obtained from the questionnaires sent to the 87 accredited nurse anesthesia schools. The questionnaires were completed by either the instructor of the Human Anatomy course or the director of the anesthesia program. No demographic data was obtained from the respondents. Since all accredited schools were surveyed, the schools vary in size, curriculum, and degree obtained. This data was not taken into consideration as the purpose of this study was to obtain a data base on how this information was taught overall.

Areas discussed include whether or not the schools have a Human Anatomy course and if so, the books used in the course, number of contact hours, student to faculty ratios for lecture and lab and use of human cadavers. If the programs use cadavers other areas discussed include how the cadavers are used (prosection, dissection, or both), and whether regional anesthesia is demonstrated and/or practiced on the cadavers (which blocks are done and the amount of time spent on each block). The use of Computer Assisted Instruction (CAI) is also discussed including the types of blocks demonstrated. Finally the instructors opinions on the importance of a three-dimensional view for regional anesthesia, the importance of teaching regional anesthesia to students, and the instructors own comfort level with regional anesthesia are presented. Each item is discussed according to the research question to which it pertains.

Research Question #1

How Many Schools Teach Anatomy

The first research question of this study was "*How many accredited Nurse Anesthesia programs teach a specific course in Human Anatomy in their graduate programs*?" It was found that 49 (63%) of the 78 respondents taught a specific course in Human Anatomy. Fourteen of the schools (18%) that answered "yes" commented that they have a combined Anatomy and Physiology course. Four of the respondents that indicated they did not teach a specific Anatomy course stated they integrate their anatomy training into courses such as a Basic Science Foundation course, Pathophysiology, and Basics of Anesthesia.

Research Question #2

The second research question was "What are the instructional methodologies of the Anatomy courses at the various schools?" This particular question covered a wide area of information including textbooks used, who taught the anatomy course, contact hours, number of hours in lecture and lab and faculty student ratios for each, whether human cadavers were used in the course and if so, what type of specimen was used.

Textbooks

Each school was able to list the textbooks used in their course. Of the 49 schools who had an Anatomy course, 26 different textbooks were cited. Although there was a great variety of books indicated, only a few were used by a large number of responding programs with Guyton's Textbook of Medical Physiology (1996) the most frequently cited. The top five books are noted (Table 1). All other books were mentioned no more than two times.

Table 1. Textbooks Used in Anatomy Courses

Books	Number	Percent
Guyton, A.C., Textbook of Medical Physiology (1996)	22	44
Moore, K.L., Clinically Oriented Anatomy (1992)	6	13
Porth, C., Pathophysiology: Concepts of Altered Health Sciences (1986)	4	8
Snell, R.S. & Katz, J., Clinical Anatomy for Anesthesiologists (1988)	3	6
Netter, F.H., Atlas of Human Anatomy (1989)	3	6

Who teaches Anatomy?

The distribution of the instructors of the 49 schools who taught an Anatomy course is reflected in Figure 1. The total is greater than 100% as each school could provide more than one answer and several schools had a combination of different types of professionals teaching the course. The Anatomist was the most frequently named with 29 (59%) followed by the Certified Registered Nurse Anesthetist (CRNA) with 15 (31%). "Other" which included medical doctors (not in anesthesia) and Ph.D.s in physiology and/or anatomy had 10 (20%), biologists with 8 (16%) and Medical Doctors of Anesthesia (MDA) with 4 (8%).

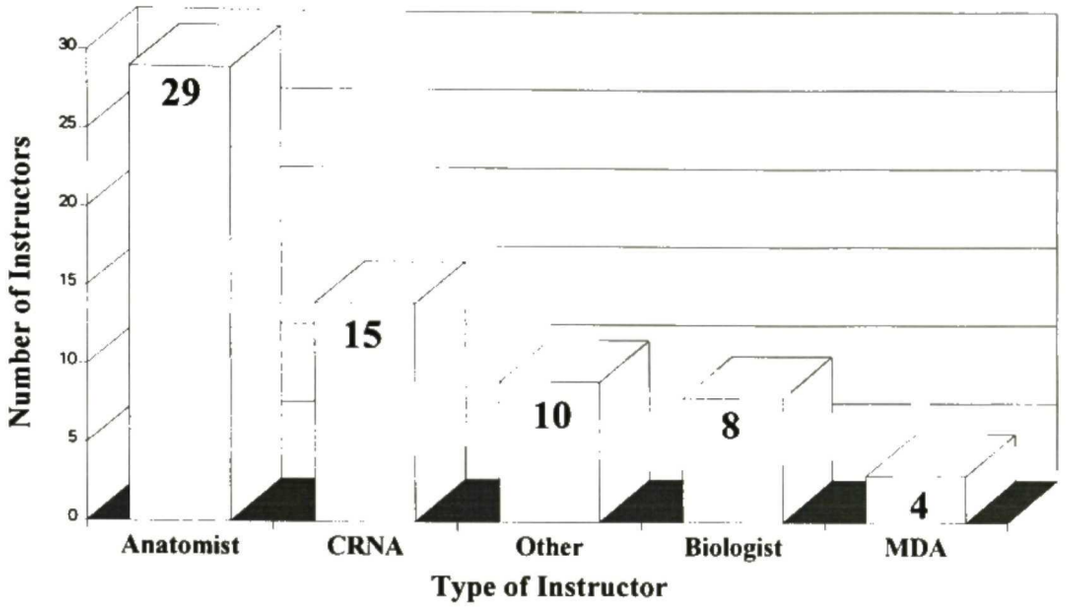

Figure 1. Who Teaches Anatomy?

Methodology

The mean and range for contact hours of the Anatomy courses and number of hours spent in lecture and lab, are depicted in Table 2. The information is for the 49 schools that taught an Anatomy course. The range for contact hours for the course varied from 30-232 hours with a mean of 108 and a mode of 135 hours. Hours per week spent in lecture ranged from 1-9 hours with a mean of 5 and mode of 3 hours. Hours per week spent in a laboratory component ranged from 0-20 with a mean of 2 and a mode of 0 hours.

Table 2. Hours for Lecture and Lab

Hours	Mean (hours)	Mode (hours)	Range (hours)
Contact hours for the course	108	135	202 (30-232)
Hours per week in lecture	5	3	8 (1-9)
Hours per week in lab[a]	2	0	20 (0-20)

[a]Twenty-nine (59%) of the 49 schools who taught Anatomy had no Lab component and so responded "0" decreasing the overall mean. The next most common answer was 5 hours per week.

Faculty-to-student ratios for lecture and lab are summarized in Table 3. Ratios for lecture ranged from 1 faculty instructor to 6-90 students with a mean of 22 and a mode of 20. Ratios for laboratory ranged from 1 faculty to 4-30 students with a mean of 12 and a mode also of 12.

Table 3. Faculty to Student Ratios for Lecture and Lab

Component	Mean (faculty to student)	Mode (faculty to student)	Range (faculty to student
Anatomy Lecture	1:22	1:20	84 (1:6-90)
Anatomy Lab	1:12	1:12	26 (1:4-30)

Cadaver Use

The next area of methodology dealt with whether or not the programs used human cadavers in their course and if so, how many hours they spent with the cadavers per week. If cadavers were used, how the specimens were employed (prosected specimens, dissection of the specimens, or both) was also determined.

It was found that 22 of the programs (28%) used cadavers in their programs with a mean and mode of 3 hours per week and a range of 11 (1-12) hours per week. Figure 2

summarizes the distribution of the way the human cadavers were used in the various programs. Only 2 schools (3%) used strictly dissection of the cadavers. Ten programs (13%) used prosected specimens and 10 (13%) used a combination of both. The number of hours per week spent on the cadavers ranged from 1-12 hours per week with a mean and mode of 3. Many schools also answered this question with "varies" and did not depict a specific number of hours per week.

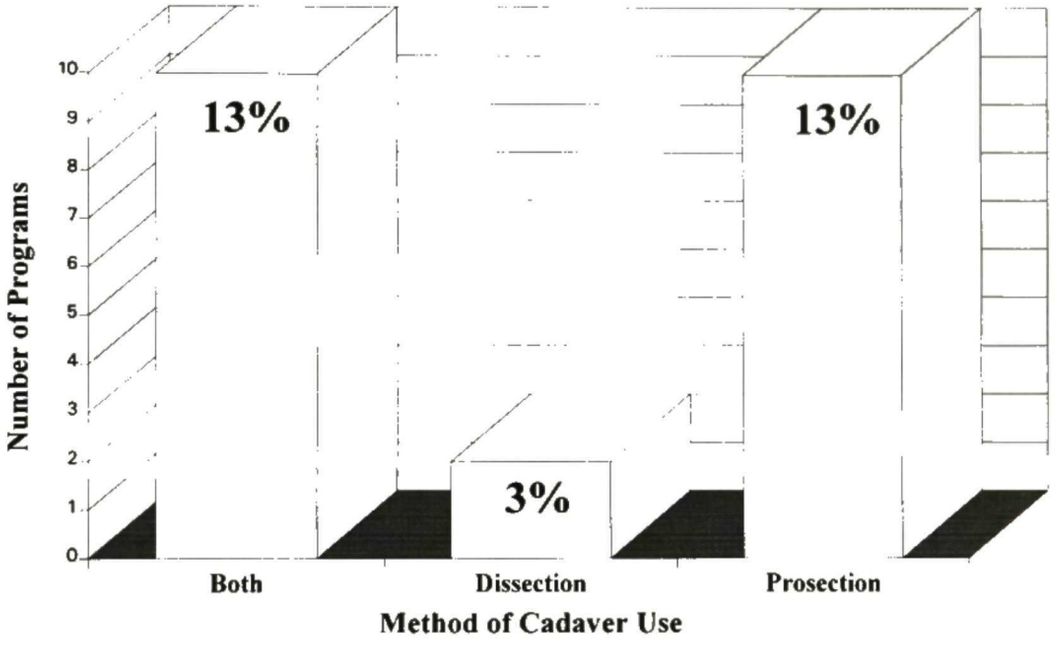

Figure 2. Type of Cadaver Use in Anatomy Courses

Research Question #3

Demonstrating Regional Anesthesia on Cadavers

Research question number three was *"Do student nurse anesthetists have the opportunity to see procedures such as regional blocks performed on cadavers prior to entering the clinical setting?"* The schools were asked to identify the blocks demonstrated on the cadavers and the time allotted for each. A total of 17 of the 22

schools who did use cadavers in their program demonstrated regional anesthesia on the cadavers.

The programs were asked to circle all regional blocks that applied. The most frequently demonstrated block was the brachial plexus (16) followed by spinal (14), epidural (13), ankle (11), intercostal and caudal blocks both with (9), digital blocks (8), individual nerve blocks and lumbar plexus (7), paravertebral (6), retrobulbar and other (4). The most time allotted was for epidural blocks with 77 minutes (mean) closely followed by spinal with 75 minutes. Table 4 summarizes the type and number of blocks demonstrated by the anesthesia programs and the mean and range of time spent on each block.

Table 4. Blocks Demonstrated on Cadavers and Time Allotted for Each

Block Demonstrated	Number of Programs Demonstrating	Time Allotted Mean (minutes)	Time Allotted Range (minutes)
Brachial Plexus	16	65	100 (20-120)
Spinal	14	75	105 (30-135)
Epidural	13	77	105 (30-135)
Ankle	11	42	110 (10-120)
Intercostal	9	42	105 (15-120)
Caudal	9	53	105 (15-120)
Digital	8	34	50 (10-60)
Individual	7	64	90 (30-120)
Lumbar Plexus	7	47	110 (10-120)
Paravertebral	6	40	110 (10-120)
Retrobulbar	4	15	20 (10-30)
Other[a]	4	38	110 (10-120)

[a]Other blocks include cervical plexus, difficult airway and peribulbar blocks.

Research Question #4

Practicing Regional Anesthesia on Cadavers

Research question number four was *"Do the students have the opportunity to practice these same procedures on the cadavers?"* Out of the 17 schools that demonstrated regional anesthesia on cadavers only 3 schools allowed the students the opportunity to practice those blocks on the cadavers. Table 5 summarizes the blocks the students practiced on the cadavers and the time allotted for each.

Table 5. Blocks Practiced on Cadavers

Block Practiced	Number of Programs Practicing	Time Allotted Mean (minutes)
Epidural	2	60
Spinal	2	50
Brachial Plexus	2	45
Intercostal	1	60
Individual	1	60
Lumbar Plexus	1	60
Ankle	1	60
Paravertebral	1	60
Other[a]	1	60

[a] Other blocks include cervical plexus, difficult airway, and peribulbar blocks.

Research Question #5

Computer Assisted Instruction

The fifth and final research question was *"Are Human Anatomy courses in nurse anesthesia programs using Computer Assisted Instruction (CAI) to instruct students in regional anesthesia techniques and if so, which blocks are being demonstrated?"* A total of 14 out of the 78 responding programs (18%) stated they used CAI in their

Anatomy course to demonstrate regional anesthesia techniques. The most frequently demonstrated block was the spinal with (14), followed by epidural (13), brachial plexus (10), caudal (6), ankle (5), digital, individual, lumbar plexus, and retrobulbar (4), and intercostal and paravertebral (3). Table 6 summarizes the blocks demonstrated by CAI.

Table 6. Blocks Demonstrated with Computer Assisted Instruction

Block Demonstrated	Number of Programs Demonstrating
Spinal	14
Epidural	13
Brachial Plexus	10
Caudal	6
Ankle	5
Digital	4
Individual	4
Lumbar Plexus	4
Retrobulbar	4
Intercostal	3
Paravertebral	3

Regional Anesthesia

Following the portion of the questionnaire pertaining to anatomy and regional anesthesia on the cadavers, the instructors were asked to describe *how regional anesthesia technique was demonstrated if cadavers were not used for demonstration and or practice of regional anesthesia technique.* The respondents could circle all that applied. Sixty (77%) stated the clinical setting (watching other practitioners) was a method they employed in demonstrating regional anesthesia. Sixty-two (80%) used

models, 54 (69%) used books, and 17 (22%) stated they used didactic only. However, the majority of the respondents that circled "didactic only" circled other answers as well suggesting this was not the only methodology applied. No one in the survey circled the response that stated regional anesthesia was not taught.

The remaining questions of the survey dealt with instructors opinions about regional anesthesia The first question in this section was *"How important do you feel a three dimensional view via a dissected or prosected cadaver is to the performance of regional anesthesia?* The instructors were asked to circle their opinion on a 7 point Likert scale with "1" being not at all important and "7" being extremely important. The mean was "4", with a mode of "3" and a full range of opinions from "1" to "7". Figure 3 demonstrates the responses of the instructors.

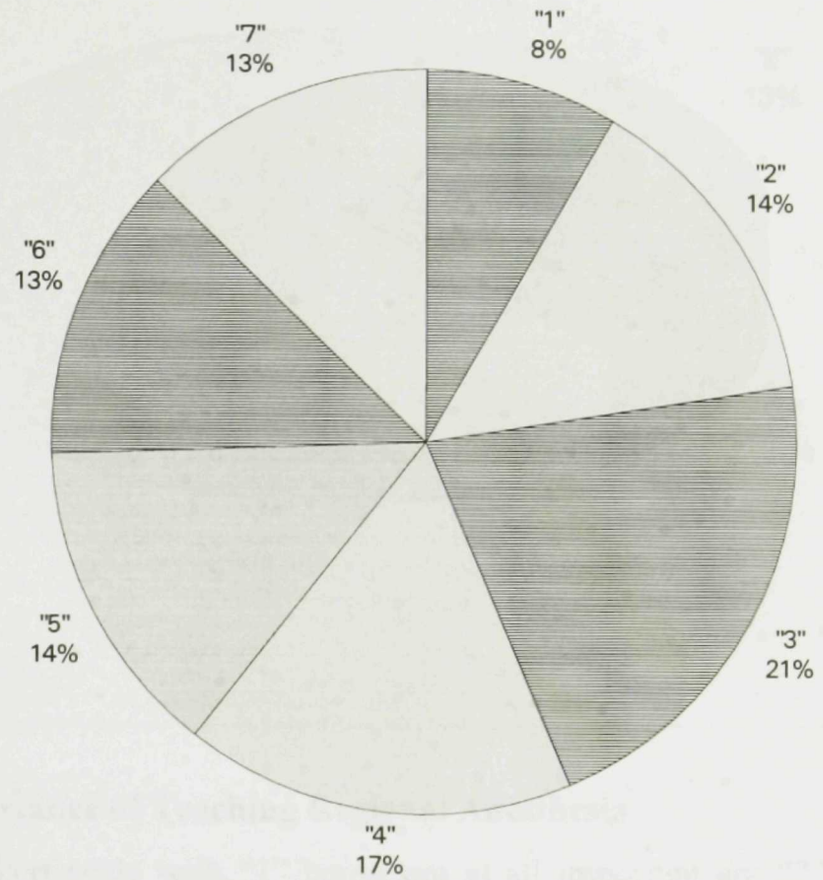

Figure 3. Importance of a Three Dimensional View to Regional Anesthesia
(Based on a Likert scale with "1" being not at all important and "7" being extremely important).

The next question was *"Do you believe it is important to teach SRNA's regional anesthesia techniques and expect a certain level of competency for graduation?"* Again, the instructors were asked to circle their opinion on a 7 point Likert scale as above. The mean answer was "6" with a mode of "7" and a range of 3 from "4" to "7". Figure 4 shows the distribution of the responses.

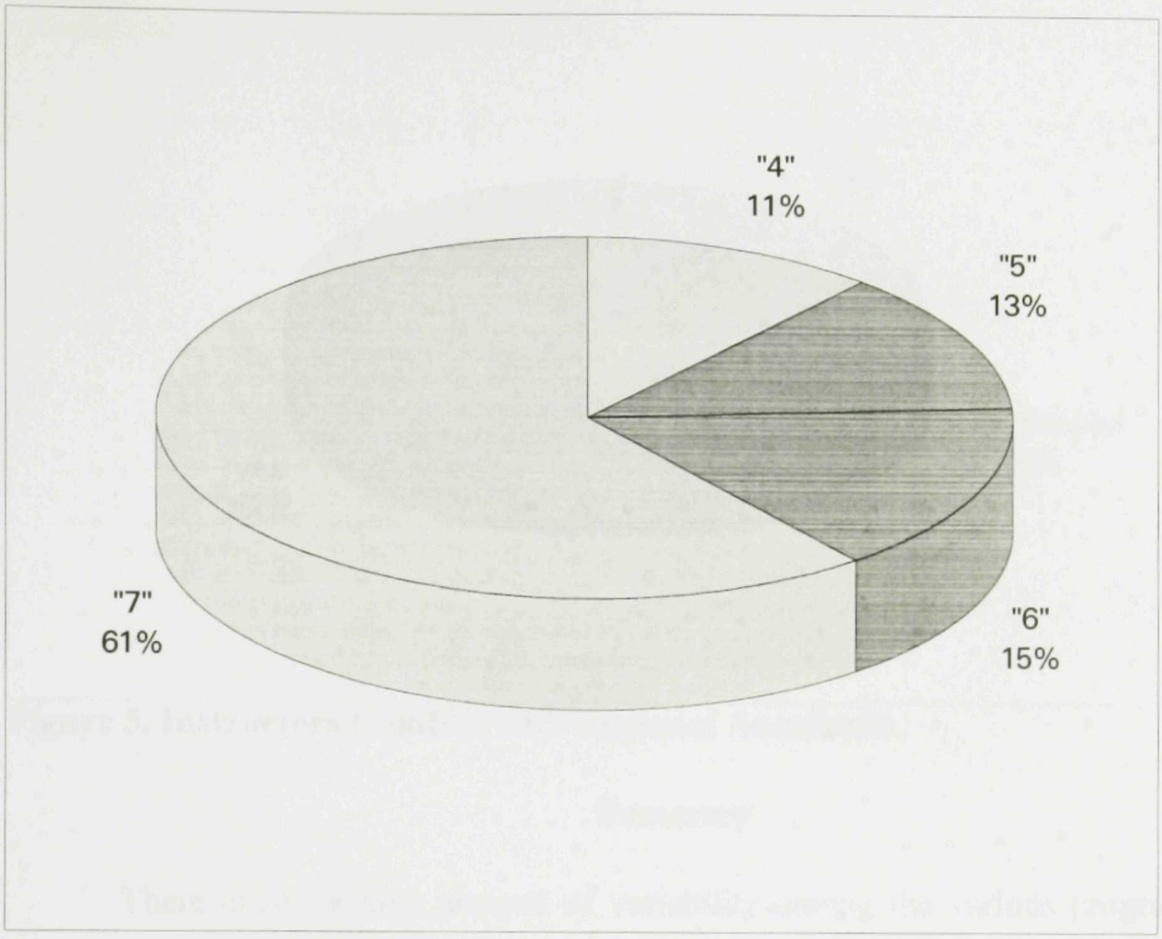

Figure 4. Importance of Teaching Regional Anesthesia

(Based on a Likert scale with "1" being not at all important ant "7" being extremely important).

The final question asked of the instructors was "*Are you comfortable with your own ability to perform regional anesthesia techniques?* Out of the 78 instructors, 48 (62%) stated they felt comfortable with their own ability to perform regional anesthesia, 17 (22%) stated they did not feel comfortable, and 12 (15%) stated the question did not apply as they were not clinician. One instructor did not complete the question. Figure 4 documents the responses to the instructors comfort with their own ability to perform regional anesthesia.

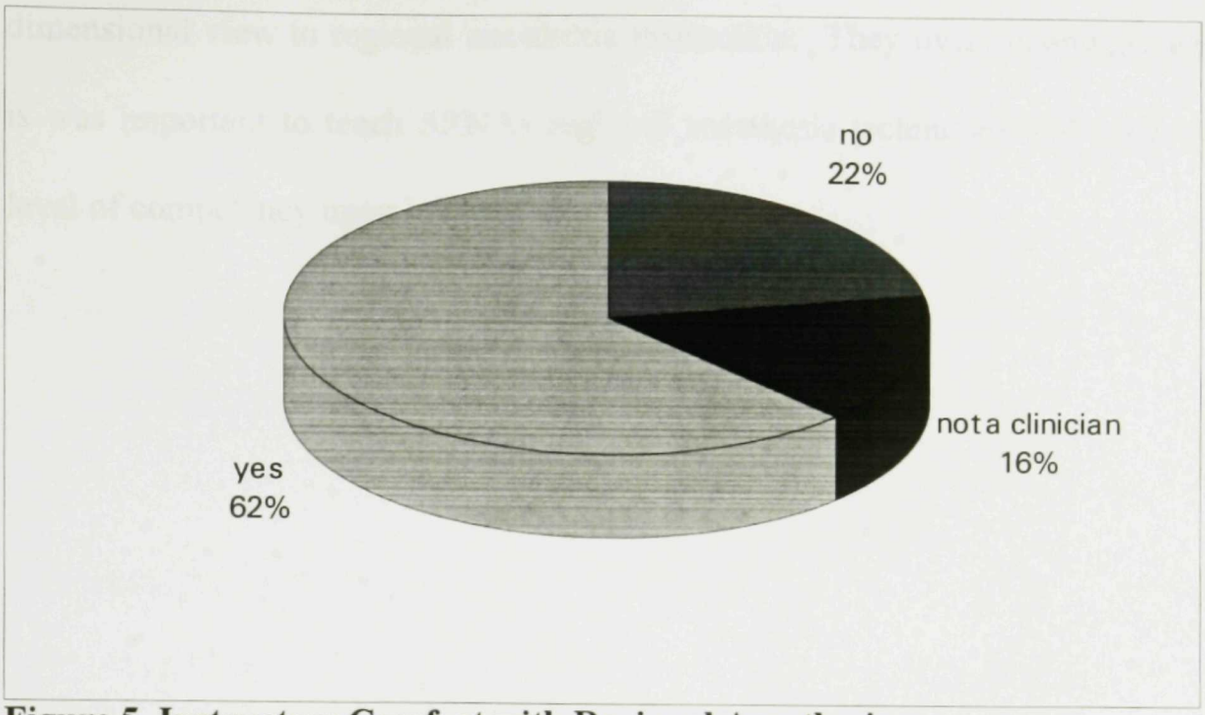

Figure 5. Instructors Comfort with Regional Anesthesia

Summary

There exists a large amount of variability among the various programs in their instruction of anatomy and regional anesthesia . The majority of programs 49 (63%) teach a specific course in human anatomy with 14 (18%) of those programs teaching a combined anatomy and physiology course. The mean hours spent in lecture was 5 hours per week. More variability in the lab hours existed with a range of 0-20 hours, a mode of 0 hours and a mean of 2 hours per week. Twenty-two (28%) of the programs use human specimens with 10 (13%) using prosected specimens, 2 (3%) using strictly dissection of specimens and 10 (13%) using a combination of both. Of the programs using human specimens, 17 (22%) have instructors demonstrate regional anesthetic techniques in situ, and 3 (4%) of the programs afford the students the opportunity to practice regional anesthetic techniques of the specimens. Computer assisted instruction (CAI) is used by 14 (18%) with many more planning to incorporate this new technique in the near future. Instructors overall where divided about the importance of a three

dimensional view to regional anesthesia instruction. They overwhelmingly agreed that is was important to teach SRNAs regional anesthesia techniques and expect a certain level of competency upon graduation.

CHAPTER 6: DISCUSSION

This chapter provides a summary of the study and recommendations and conclusions drawn from the data in Chapter Five. Areas of the study will be addressed by research question followed by a discussion on regional anesthesia. The chapter will end with conclusions and recommendations for future study.

Research Question #1

How Many Schools Teach Anatomy

The first research question of this study was *"How many accredited Nurse Anesthesia programs teach a specific course in Human Anatomy in their graduate programs?* The question relating to this topic on the questionnaire was "Do you currently teach a Human Anatomy course in your anesthesia program?" Although the question requested a "yes" or "no" response, fourteen schools indicated "yes" and noted in their comments that their course was combined with other subjects such as physiology and/or pathophysiology. Similarly, four schools indicated "no" and that they integrate this subject in other courses as it is applicable. That leaves 25 schools who answered "no" without explanation.

These discrepancies make the answers to this question somewhat inconclusive. For example one respondent who answered "no" stated "anatomy, per se, is taught with physiology; anatomy for regional anesthesia is taught separately in advanced principles courses". Another respondent who answered "yes" commented "anatomy is integrated with physiology and pathophysiology and is taught by organ system."

This information is taught in some form in all of the programs studied or they would not be accredited. Therefore, the real question becomes, if Human Anatomy is not taught, is this information, required by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) ever learned? Other aspects to consider include: Do aspects of anatomy integrated into other courses provide adequate information and/or if a specific course is dedicated to anatomy is it superior? This information was not determined by this study and would require a more in depth analysis of each individual program.

Research Question #2

Methodology

The second research question was *"What are the instructional methodologies of the Anatomy courses at the various schools?"* The items on the questionnaire pertaining to this research question addressed specific areas such as textbooks used, who teaches the course, hours for lecture and lab, and faculty to student ratios for lecture and lab. This information provided a data base only. It is interesting to note the variability of the responses.

Required textbooks were variable. Twenty-six different textbooks were used among the 49 schools teaching an anatomy course. Out of the five top textbooks mentioned, the most frequently used book by Guyton was a physiology textbook (44% of programs), the second, the anatomy book by Moore (13%), and the third most frequently recommended book was the pathophysiolgy textbook by Porth (8%). Thus, over half (52%) of the programs surveyed combine anatomy/physiology/pathophysiology texts

suggesting that many more programs combine these subjects than is suggested from the results of research question #1.

The most frequently mentioned instructor for the anatomy course was the anatomist with 29 (59%) followed by the certified registered nurse anesthetist (CRNA) with 15 (31%). Many programs used a combination of different instructors to cover all aspects of anatomy as it pertains to the practicing CRNA. One respondent commented "I am the anatomist, a CRNA teaches the blocks." Others stated they had full time or guest lectures from physicians with anesthesiologists and critical care specialists mentioned by name.

The hours spent on the course also depicted a great deal of variability. The contact hours for the course ranged from 30-232 hours. The lab hours per week ranged from 0-20 hours (59% of the programs that taught anatomy had no lab component).
It is difficult to conceive how a course of 30 contact hours and no lab could be similar to a course with 20 hours of lab or 232 contact hours. The scope of this questionnaire did not allow for a description of the breakdown of how lecture or lab hours were spent or details of how the information was taught. This is of particular importance in the discussion of cadaver use. For example, it is not known how much of the lab time was actually spent on prosected cadavers, the dissection of cadavers, models, computers or other teaching methodologies.

Cadaver Use

The respondents were asked whether human cadavers were used in their program and if so how many hours per week was spent with the specimens. They were also asked about the type of specimens used prosected, dissection of specimens or both. A total of

22 programs (28%) used cadavers in some fashion. Only 2 schools (3%) used strictly dissection of the cadavers. Ten programs (13%) used prosected specimens and 10 (13%) used a combination of both. The difficulty comes in trying to determine the significance of this information. The number of hours spent on the cadavers ranged from 1-12 hours per week. Many more instructors simply stated that the hours "varied" with no further explanation. This number did not reflect how many hours were spent in dissection versus the examination of prosected specimens.

Several programs who were not currently using cadavers commented that they would be interested in this methodology. One respondent wrote "I feel that the use of cadavers would be very beneficial for teaching regional anesthesia as well as airway management, invasive monitoring and other subjects. I wish we had that capability". Another stated "we have recently changed our curriculum to include a 5 credit Gross Anatomy course utilizing human cadavers."

Out of the 49 schools who teach anatomy 47% use cadavers in some aspect of their course. Even the programs who did not use the cadavers for regional anesthesia demonstration do not dispute the fact that cadavers are beneficial for realistic instruction of the human anatomy. As has previously been stated, the anatomy laboratory is an invaluable tool for providing the student with the knowledge of the look, feel, and complex three-dimensional assembly of human structure (Marks, Cahill, & Scothorne, 1996).

Research Question #3

Demonstrating Regional Anesthesia on Cadavers

After the use of cadavers in the anatomy courses was established, the programs were asked to identify regional anesthesia techniques demonstrated on the cadavers and the time allotted for each. A total of 17 of the 22 programs who did use cadavers in their program demonstrated regional anesthesia on the cadavers. The most frequently demonstrated blocks were the brachial plexus (16), spinal (14) and epidural (13). These blocks were also allotted the most lab time for demonstration purposes with 77 minutes allotted for epidural, 75 minutes for spinal, and 65 minutes for brachial plexus. This is consistent with the most frequently performed regional anesthesia techniques by certified registered nurse anesthetists (CRNAs) and student registered nurse anesthetists (SRNAs).

Horton (1993) found that students at the 92 nurse anesthesia programs at that time administered subarachnoid (spinal) anesthesia in 87% of the programs, epidural in 79%, and axillary (brachial plexus) in 65% of the programs. Horton & Jordan (1994) found that out of 94 programs questioned, 83 programs (88%) offered their students experience in actual administration of subarachnoid blocks, 75 (80%) epidural blocks, and 68 (72%) axillary blocks. The 1985 American Association of Nurse Anesthetist (AANA) Membership Survey Results also found these techniques to be the most frequently performed by CRNAs with 40.8% performing spinal, 27% performing brachial plexus blockade, and 22.2% performing epidural techniques (Heimler & Schumacher, 1985). The surveys also had a high percentage of providers performing Bier blocks which was not discussed in this particular study.

Research Question #4

Practicing Regional Anesthesia on Cadavers

The programs were also asked if they afforded the students the opportunity to practice regional anesthesia on the cadavers. Only 3 of the 17 programs that demonstrated regional anesthesia on the cadavers actually practiced these same techniques on the cadavers. One respondent stated " they study the anatomy using the cadaver and we try to simulate the blocks, but they don't actually 'practice' doing the block." A few of the programs stated they allowed the students to practice independently if they desired. Many more programs stated they did not feel that practicing regional anesthesia was accurate on cadavers. One respondent commented "unable to practice blocks on cadavers, we tried initially but landmarks, tissues etc. are not realistic on cadavers."

When regional anesthesia first became an accepted technique of anesthesia. The importance of studying on a human cadaver was unparalleled. Dr. Labat (1922), one of the pioneers of regional anesthesia stated "training on the skeleton and cadaver leads to a thorough knowledge of the anatomy required for the injection of patients." He felt "the beginner will learn much about nerve blocks by performing them on cadavers, using injections of a suitable contrast medium such as methylene blue, and following these by sharp dissections." Medical schools have been using human cadavers for centuries since the beginning for human anatomy training and there is no disputing the accuracy of seeing anatomy in situ (Vesalius, 1543).

The question becomes is this the most effective way to practice regional anesthesia techniques? When instructors where asked about the importance of a three

dimensional view via a dissected or prosected cadaver to the performance of regional anesthesia their opinions where split with a mean of "4" on a 7 point Likert scale ("1" being not at all important and "7" being extremely important) with a mode of "3" and a full range of opinions from "1" to "7". This indicates that many instructors are not convinced this is an important aspect of regional anesthesia training. One respondent writes "demonstration/return demonstration is not great on cadavers, but more appropriate with simulators. The cadaver labs are employed to provide thorough instruction of anatomy." It seems many instructors in nurse anesthesia programs are leaning towards Computer Assisted Instruction (CAI) rather than cadaver training for regional anesthesia techniques.

Research Question #5

Computer Assisted Instruction (CAI)

A total of 14 out of the 78 responding programs (18%) are currently using CAI in their Anatomy course to demonstrate regional anesthesia techniques. One instructor stated "Attempted to use cadaver models from Mortuary Science, but an inordinate amount of time had to be spent 'preparing' the body so that quality class time could be used in familiarizing students with the anatomy. Would like to use computers (i.e. CAI) and will be attempting to do so in the next year or so." Many other programs stated that CAI was recommended for future review or that they were presently considering adapting CAI to be utilized in their Anatomy course. This new technique allows for a three dimensional view without having to obtain and maintain cadavers and is something that more and more programs will be adapting in the near future for their regional anesthesia training.

Regional Anesthesia

The issue of nurse anesthetists performing regional anesthesia has long been an issue of debate. Certified Registered Nurse Anesthetists (CRNAs) are expected to learn skills in managing regional anesthetics as part of curriculum requirements for their nurse anesthesia programs, but not all students have experience in actually performing regional anesthesia techniques (Horton, 1993). According to the Council on Accreditation for Nurse Anesthesia Educational Programs, approximately 10% of the programs still do not have the opportunity to practice regional anesthesia (G. Holiday, personal communication, May 7, 1997). One survey respondent writes "presently, only the management of regional anesthesia is provided. Hopefully, later this year we will begin the actual administration of regional anesthesia."

Many currently practicing CRNAs were trained in this atmosphere where their practice of regional anesthesia was limited. Some instructors indicated that nurse anesthetists were not allowed to do regional anesthesia in their geographic area and that it was controlled by hospital bylaws. When instructors were asked if they were comfortable with their own ability to perform regional anesthesia techniques many answered "no", or that they were never taught. One instructor comments "It is extremely difficult to maintain any level of experience in regional for our students. The philosophy of our chairman is only MD's place blocks. I am a graduate of this program 30 years ago and was not taught regional techniques."

Many people have examined this "competition" between anesthesiologists and nurse anesthetists. Zambricki and Ouelette (1987) examined reasons for closure of nurse anesthesia programs and found that one contributing factor was "some...anesthesiologists

commented that they were no longer interested in being involved in nurse anesthesia education programs, because they were not interested in 'preparing their competitors'". This seemed to be a central theme from many of the respondents. A few examples of comments regarding the administration of regional anesthesia include:

1. "I feel that not being able to do regional anesthesia limits your practice. I also believe that this is an attempt to control our practice by anesthesiologists."
2. "I believe this issue is a political one. CRNAs would like to do regional anesthesia and are prohibited from learning because of the turf battle between CRNAs and MDAs (Medical Doctors of Anesthesia)."
3. "Unfortunately, regional anesthesia is exclusively performed and taught by MDAs in our school. Occasionally they hold the clinical teaching 'ransom' for political reasons."

At the present time, the administration of regional anesthesia by nurse anesthetists is strongly encouraged but the American Association of Nurse Anesthetists (AANA) has determined that regional administration will be a requirement by the year 2000 for graduating student registered nurse anesthetists (SRNAs). Currently the proposed guideline will be 20 total (all techniques of regional anesthesia) although this number is still under discussion. Previous studies have shown a wide variability in the amount of regional anesthesia training that residents are exposed to during training and there has been much debate on how much training is enough to be proficient. A study presented at the American Society of Regional Anesthesia (ASRA) annual meeting by Kopacz and Neal (1994) suggests that 40 attempts of each technique are necessary before sustained

improvement and success occurs and suggests this as a minimum number before proficiency is attained.

Kopacz and Neal examined performance of anesthesia techniques during the first three months of training of seven beginning CA-1 residents. They found the learning curves of endotracheal intubation, spinal anesthesia, and epidural anesthesia all followed a characteristic pattern. Initial expected low success rate was followed by rapid improvement and an early success 'peak' within the first 20-25 attempts. The researchers felt this was due to close supervision and liberal verbal suggestions given to residents early in training. They found the subsequent 'failure' trough in the learning curve was most likely due to autonomy given to residents after demonstrating familiarity with equipment, having learned the basic procedure, but not yet mastered the physical skills. The final upslope of the curve came with continued improvement which occurs with experience, ultimately resulting in proficiency of the technique. There conclusions were that as 40 attempts were necessary before sustained improvement and success occurred, they suggested that as a minimum number before proficiency in spinal and epidural techniques are attained.

Regardless of the exact number of blocks that will be required the necessity of adequate instruction of regional anesthesia is a reality. Even at institutions where regional anesthesia is performed strictly by anesthesiologists, a thorough background of instruction must be taught for students to be able to transition into jobs where they will be expected to be proficient in regional techniques. One instructor writes "In this state CRNAs do not typically perform blocks (political), but our students easily transition to positions where this is an expectation". This particular instructor stated the students

practice up to 280 blocks using Computer Assisted Instruction (CAI). This study did not exam the proficiency of the students performance of regional anesthesia but rather the methodology used to instruct these techniques and the instructors opinions related to regional anesthesia.

The instructors were asked how regional anesthesia was demonstrated if cadavers were not used for demonstration and or practice of regional anesthesia techniques. The question lost some of it's value in that all instructors completed this section regardless of whether they used cadavers in their program or not. The information obtained still showed that the clinical setting (watching other practitioners), models, books, and didactics were all methods used to demonstrate regional anesthesia in addition to the instructors who used cadavers and/or Computer Assisted Instruction (CAI) for demonstration. The comments made by the instructors are probably most enlightening about the type of instruction students are receiving. The following are quotes from various instructors related to regional anesthesia training:

1. "Our students begin regional experience immediately upon beginning clinical experience. For example, our students probably perform over 100 spinal anesthetics during their training.
2. "I believe we have an excellent regional course and experience for students--models and charts appear very adequate for the clinical experience."
3. "The only blocks we teach for clinical competency are spinal, lumbar epidural, and IV regional".
4. "Students perform regional anesthetics in our OR and OB. Students have unlimited access to regional anesthetics."

5. "Regional is important, but is a technical skill. Didactics are critical."
6. "We are not allowed to teach SRNAs regional in this institution but do rotate those interested to 2 military sites."
7. "In recent years our students are receiving excellent regional experience. We have rural CRNA only practice settings where we affiliate for regional anesthesia."

Although the programs did differ on their approach one thing the instructors did agree on was the importance of teaching regional anesthesia techniques to student registered nurse anesthetists (SRNAs). When they were asked if they believed it was important to teach SRNAs regional anesthesia techniques and expect a certain level of competency for graduation the mean answer was "6" with a mode of "7" and a range from "4" to "7" on a 7 point Likert scale ("1" being not at all important and "7" being extremely important). Therefore, the issue is not whether it is important to teach regional anesthesia, but rather how to go about it.

Limitations in the Study

There are limitations in any descriptive study. The first limitation in this study was a response rate of less than 100%, which does not make this study all inclusive. Although the 90% response rate makes it more than representative, some important information may be unreported. The other obvious limitation was the manner in which the questionnaires were completed by respondents. The respondents were generally complete and the comments thorough. However, like in any study, questions were at times left blank which could potentially skew data. The assumption was made that the information described by the respondents was accurate.

Several unexpected limitations were also discovered in the process of this study. The nature of the questionnaire involved questions about the anatomy course as well as regional anesthesia training. Every effort was made to identify the correct contact person to complete the survey, often the anatomist or other instructor responsible for the anatomy course. However, several times if the instructor of the anatomy course completed the survey, areas of the questionnaire pertaining to regional anesthesia would remain blank with comments similar to these respondents. "The course structure must be somewhat different for this program. You may wish to survey the Program Director on these other topics" or "this is not the goal of the anatomy portion". Other comments from the instructors included the fact that several of the schools use an area university for their sciences and then return to their individual schools for their clinical experience. Therefore, the instructor could not comment on the regional anesthesia portion unless it was specifically taught in their class. If the program director completed the survey, often the exact number of hours spent in lab or with the cadavers was unknown. This variability no doubt reflects on the results of this study.

Finally, although the questionnaire asked specific questions about Human Anatomy courses and regional anesthesia, neither subject was covered comprehensively. As one respondent stated "the questions on this survey do not allow me to clearly describe the type of Human Anatomy instruction that is offered at this school." Likewise, other respondents commented that their program had dedicated regional anesthesia courses or that regional was taught in basic and/or advanced principles classes rather than in Anatomy. It was not the purpose of this study to thoroughly cover both subjects (an insurmountable task for this researcher). Rather, this study was intended to be a

beginning for further research on both subjects and the examination of how many anesthesia programs have integrated some aspects of regional anesthesia into anatomy courses for an increased educational experience for their students.

Conclusions

There is a significant lack of information regarding the teaching of human anatomy to nurse anesthesia students. Although there have been numerous studies of instructional methods in medical school anatomy teaching, this is the first study to examine the instruction of nurse anesthesia students in human anatomy. Anatomy has been the foundation of medical school curriculum for centuries. Final year medical students, just prior to graduation, have ranked gross anatomy with the dissection course and integrated clinical topics as a keystone to their clinical practice (Pabst, 1993). As nurse anesthetists perform procedures identical to their medical counterparts in anesthesia, it would be expected to have similar importance.

The purpose of this study was to describe how human anatomy and cell biology information including the incorporation of regional anesthesia training was taught in nurse anesthesia programs. It was found that the majority (63%) of the programs have a specific course in human anatomy, with 18 of those combining anatomy and physiology. Extensive variability in teaching methodologies exists, especially the lab component, with a majority (59%) having no lab component at all. Twenty-two (28%) use cadavers, of which 10 (13%) use prosection, 2 (3%) use dissection, and 10 (23%) use both. Of the programs using cadavers, 17 (22%) have instructors demonstrate regional anesthesia in situ, however, only 3 (4%) allow students to practice these techniques on the cadavers. Computer Assisted Instruction (CAI) is presently used to demonstrate regional anesthesia

by 14 (18%) of programs, however, many more are planning to incorporate this technique in the near future. The reported regional anesthesia blocks (via cadaver and CAI), both demonstrated and practiced, correlated well with those most frequently performed in clinical practice (Heimler & Schumacher, 1985, Horton, 1993, Horton & Jordan, 1994). This information obtained in this study also enabled a comparison of the Human Anatomy and Cell Biology course at the Uniformed Services University of the Health Sciences (USUHS) (Appendix A) to other anesthesia programs. The nurse anesthesia program at USUHS is unique in that it trains military officers who will at many times be required to work in remote locations with minimal or no physician support and also perform many regional anesthesia techniques. Therefore, it is imperative they receive proper training for this responsibility. It was found that the Anatomy and Cell Biology Course at USUHS was comparable to the most comprehensive courses at other programs as far as contact hours, hours of lab, faculty to student ratios, the use of human cadavers (one of 10 programs that used dissection and prosected specimens) and demonstration and practice of regional anesthesia on the cadavers.

Having an advanced and comprehensive course is important as military CRNAs often perform more regional anesthesia than their civilian counterparts and their training must remain on the cutting edge. The 1985 AANA membership survey showed that every CRNA practicing in a military environment performed spinal and axillary (brachial plexus) anesthesia. The next closest performance of regional anesthesia by CRNAs was in a university setting with 57.7% performing spinal and 43.9% performing axillary anesthesia (Heimler & Schumacher, 1985). Although the military does perform more regional anesthesia than many civilian CRNAs the expansion of regional anesthesia into

the CRNA practice is increasing rapidly. It is therefore imperative that future SRNAs get adequate training in both anatomy and regional anesthesia.

This study is only a beginning examination of anatomy and regional anesthesia training in nurse anesthesia programs. It provides a preliminary data base for the COA, and may possibly recommend requiring a core course specific to anatomy to optimally prepare nurse anesthetists for practice. This information may allow for more consistent instruction and improved presentation in this area of the curriculum. This study highlights a great deal of variability in the teaching of anatomy and regional anesthesia in the various programs. With such disparity among programs, a need for further investigation regarding the efficacy of different instructional techniques is warranted. Albert Einstein, sums it up best saying, "I never teach my pupils; I only provide the conditions in which they can learn" (Walter & Marks, 1981, p. 1). That is the ultimate goal, to provide the learning conditions and information necessary for nurse anesthetists to be confident and competent providers. Future studies need to be done on identifying the optimal learning experience for nurse anesthesia students to improve their knowledge of anatomy and their regional anesthesia techniques.

Recommendations for Future Studies

Although this study sought to determine how regional anesthesia training was incorporated in Human Anatomy courses, this did limit the ability to obtain comprehensive information on either subject. As previously mentioned, the best contact person to complete the questionnaire was also difficult to determine at times. Future studies would be wise to separate the two subjects inquiring about either Anatomy courses or regional anesthesia.

For example, if anesthesia programs do not have an Anatomy course where is this information required by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) taught? A more detailed outline from the programs on where this information it taught would be helpful. Likewise, a more detailed outline of where regional anesthesia is taught (if not in Anatomy) would be of interest.

Another question unanswered by this study is whether one instructional method is superior for the graduating nurse anesthetists knowledge base of human anatomy as well as the performance of regional anesthesia techniques involving anatomy (cadavers versus no cadavers, dissection or not, Computer Assisted Instruction (CAI) or not, or no formal anatomy course at all). A survey could be generated for newly practicing CRNAs examining their comfort level with regional anesthesia as it relates to the type of anatomy instruction they received. This question could also possibly be answered by examining students performance on the anatomy portion of such tests as the Self Evaluation Exam (SEE) as it relates to the type of instruction they have received.

An informal survey of practicing CRNAs performed by this researcher found that many would like to go back and take Anatomy again and wish they had paid more attention to detail the first time. This is consistent with a study by Pabst (1993) who interviewed graduating medical students. He found the vast majority would have liked to have repeated anatomy during the clinical curriculum and approximately 75% expressed an interest in short dissection courses during the later clinical phase. Perhaps this concept is something to consider with nurse anesthetist students as well with mini-review sessions instituted after clinical begins on portions of the anatomy most relevant to clinical practice.

Finally, continued studies should be done on regional anesthesia. How many programs actually perform it? What blocks do they perform and how many? One instructor commented "what is the percentage of practitioners not in the military who perform a wide spectrum of blocks?" It would be interesting to know. As our practice moves into the 21st century the importance of keeping our students abreast of the most updated information and techniques is imperative if we are to continue to grow as a profession.

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APPENCICES

A. Outline for USUHS Anatomy and Cell Biology Course

B. Council of Certification of Nurse Anesthetist Examination Content Outline

C. Letter Requesting Contact Person fo Anatomy and Call Biology Coordinators

D. Content Validity Review

E. Initial Letter to Nurse Anesthesia Anatomy and Cell Biology Coordinators

F. Letter Accompanying Questionnaire for Test-Retest Participants

G. Questionnaire Sent to Anatomy and Cell Biology Coordinators

H. Internal Review Board (IRB) Approval Letter

A. Outline for USUHS Anatomy and Cell Biology Course

Lectures: 28 hours

Laboratories: 63 hours

Exams: 4 hours

Texts: Brown, D. Atlas of Regional Anesthesia

McCance, K.L. & S.E. Huether, Pathophysiology

Moore, K., Clinically Oriented Anatomy

Netter, F.H., Atlas of Human Anatomy

Sauerland, E.K., Grant's Dissector

Week 1 Overview and nomenclature for anatomy

Cell Structure and function

Cell Cycle/Basic tissues

Peripheral nervous system

Week 2 Lab orientation/back (lab)

Spinal cord and nerves/Posterior triangle (lab)

Clinical Correlation: Spinal, Epidural, & Caudal

Muscloskeletal anatomy and muscle organization of upper extremity

(3 hrs)

Embryology of the musculoskeletal system

Upper extremity I (lab)

Clinical Correlation: Brachial Plexus Block

Upper extremity II (lab)

Clinical Correlation: Median, Ulnar, Radial,

Musclecutaneous, & Digital Nerve Blocks

Week 3 Introduction to cardiovascular and respiratory systems

Radiographic anatomy of the thorax (2 hrs)

Respiratory system and mechanics of respiration

Trachea and lungs (lab)

Clinical Correlation: Endotracheal Intubation

Chest wall, pleural and pericardial cavities (lab)

Clinical Correlation: Intercostal Nerve Blocks

Coronary and Fetal Circulation Circulatory System

Heart and mediastinum (lab)

Autonomic nervous system (2 hrs)

Superior and posterior mediastinum (lab)

Cell Biology of the Circulatory System

Week 4 Body wall, inguinal region and hernia

Abdominal wall, inguinal region, and abdomen (lab)

Clinical Correlation: Ilio-inguinal nerve blocks

Peritoneum, viscera and organization of abdomen

Esophagus, stomach, duodenum, jejunum, liver, pancreas and spleen (lab)

Urinary/Reproductive system

MID-TERM EXAM

Week 5 Musculoskeletal anatomy and organization of the lower extremity (3 hrs)

Lower extremity I (lab)

Clinical Correlation: Individual Nerve Blocks

(Sciatic, Femoral, Obturator, Lateral Femoral Cutaneous)

Lower extremity II (lab)

Clinical Correlation: Lumbar Plexus, "3 In 1" Block

Lower extremity III (lab)

Clinical Correlation: Ankle and Digital Nerve Blocks

Week 6 Head and Neck (3 hrs)

Head and neck, face and muscles of mastication (lab)

Clinical Correlation: Cervical Plexus Blocks, Stellate Ganglion Block and Facial Blocks

Cranial vault and cranial nerves (lab)

Orbital Anatomy/Retrobulbar Block

Week 7 Nasal and oral cavities (lab)

Cell biology of the respiratory system

Week 8 Blood supply and venous drainage of the head and neck

Laryngeal anatomy

Deep neck and larynx (lab), Review of thorax

FINAL EXAM

B. Council of Certification of Nurse Anesthetists Examination Content Outline

The following topical outline is provided to assist candidates in preparing for the Certification Examination. It is a guide only which suggests topics and topical areas to generate and categorize examination questions. It is not all inclusive, with some elements applying to more than one area. The Council reserves the right to determine examination content, to classify examination questions, and to determine the percentage of test questions from each topical area. The approximate percentages of questions in each major content area are provided below.

Percentage of Questions	**Content Outline**
30%	I. Basic sciences

A. Anatomy, physiology and pathophysiology

1. Cardiovascular
   a. Arrhythmias
   b. Ischemic heart disease/Angina
   c. Myocardial infarction
   d. Hypertension
   e. Congestive heart failure
   f. Shock
   g. Valvular heart disease
   h. Cardiomyopathy
   i. Peripheral vascular disease
   j. Pacemaker
   k. Pericardial processes/tamponade

2. Respiratory
   a. COPD/emphysema/obstructive
   b. Reactive airway conditions/asthma
   c. Pneumonia
   d. Tuberculosis
   e. Pulmonary embolism
   f. Cor pulmonale
   g. Pulmonary hypertension
   h. Upper respiratory infection
   i. Sarcoidosis/restrictive
   j. Adult respiratory distress syndrome
   k. Intra-plural (hemo/pneumothorax)

3. Central nervous system
   a. Seizures

b. CVA/Vascular lesions
c. Hydrocephalus
d. Parkinson's
e. Multiple sclerosis
f. Myasthenia gravis
g. Alzheimers/dementia
h. Demyelinating disease
i. Intracranial hypertension
j. Autonomic hyperreflexia/Dysautonomia
k. Neuropathy/Myopathy
I. Coma
m. Mental disorders
n. Spinal cord injury

4. Musculoskeletal
   a. Fractures
   b. Arthritis
   c. Muscular dystrophy
   d. Scoliosis

5. Endocrine
   a. Diabetes mellitus
   b. Diabetes insipidus
   c. Hypo/hyperthyroid
   d. Cushing's disease
   e. Addisons's disease
   f. Pituitary dysfunction
   g. Pheochromocytoma
   h. Acromegaly
   i. Hypo/hyperaldosteronism

6. Hepatic
   a. Hepatitis
   b. Cirrhosis/portal hypertension
   c. Hepatic failure

7. Renal
   a. Urolithiasis/kidney stones
   b. Acute renal failure
   c. Chronic renal failure

8. Hematologic
   a. Anemia
   b. Sickle cell/hemoglobinopathies
   C. Polycythemia/leukemia

d. AIDS/HIV
e. Coagulopathies

9. Gastrointestinal
   a. Ulcer disease
   b. Ulcerative colitis
   c. Diaphragmatic hernia
   d. Hiatal hernia/gastric reflux
   e. Gallstones/gall bladder disease
   f. Pancreatitis
   g. Splenic disorders
   h. Carcinoid syndrome

10. Other conditions
   a. Cancer
   b. Obesity
   c. Glaucoma/open globe
   d. Hypothermia
   e. Hyperthermia
   f. Major trauma
   g. Critical care
   h. Smoking
   i. Substance abuse (alcohol and drugs)
   j. Airway difficulties
   k. Collagen/Lupus erythematosus
   I. Immunosuppression/malnutrition

B. Pharmacology

1. General principles
   a. Pharmacodynamics
   b. Pharmacokinetics
   c. Anaphylaxis
   d. Drug interactions

2. Inhalation anesthetics

3. Intravenous anesthetics
   a. Barbiturates
   b. Opiods (agonist/antagonist)
   c. Benzodiazepines
   d. Other

4. Local anesthetics
   a. Esters

b. Amides

5. Muscle relaxants/antagonists

6. Autonomic and cardiovascular drugs

7. Others
   a. CNS drugs
   b. Diuretics
   c. Autacoids

C. Chemistry, biochemistry, physics

5% **II. Equipment, instrumentation, and technology**

A. Anesthetic delivery systems
   1. High/low pressure gas sources
   2. Regulators/manifolds
   3. Flowmeters, valves, floats
   4. Vaporizers
   5. Proportioning systems
   6. Pressure failure safety devices
   7. "Fail-safe" devices
   8. Ventilator
   9. Carbon dioxide absorbent
   10. Anesthetic circuits
   11. Pneumatic and electronic alarm devices
   12. Flow-over systems
   13. Jet ventilation
   14. Infusion devices

B. Airway equipment
C. Monitoring devices

   1. Central nervous system
      a. Electroencephalogram
      b. Evoked potential
      c. Intracranial pressure

   2. Cardiovascular
      a. Electrocardiogram
      b. Arterial pressure monitoring
      c. Noninvasive blood pressure monitoring
      d. Transesophageal echocardiography
      e. Central venous pressure monitoring

f. Pulmonary artery pressure monitoring/SV02
g. Cardiac output

3. Precordial/esophageal stethoscope/Doppler

4. Respiratory monitoring
   a. Apnea monitor
   b. Capnography
   c. Mass spectrometry
   d. Pulse oximetry
   e. Airway pressure
   f. Respirometer
   g. Blood gas analysis

5. Peripheral nerve stimulator

6. Renal monitoring

7. Temperature monitoring

8. Maternal/fetal monitoring devices

9. Others
   a. Blood warmers
   b. Warming blanket
   c. Heat moisture exchanger
   d. Heated humidifier

31 % **III. Basic principles of anesthesia**

A. Preoperative assessment

B. Preparation of patient

C. Fluid/blood replacement

D. Positioning

E. Interpretation of data

1. Lab tests

2. Diagnostic data

3. Intraoperative monitoring data

F. Airway management

1. Mask
2. Intubation
3. Cricothyrotomy
4. Fiberoptics

G. Local/regional anesthesia

1. Infiltration
2. Regional blocks
   a. Subarachnoid
   b. Epidural
   c. Brachial plexus
   d. Transtracheal
   e. IV regional (Bier)
   f. Retrobulbar/peribulbar
   g. Ankle
   h. Digital
   i. Femoral/sciatic

H. Monitored anesthesia care/conscious sedation

I. Pain management

1. Epidural analgesia
2. Infiltration nerve blocks
3. Intrathecal narcotics

J. Others

1. Hypotensive
2. Hypothermia
3. Intra-operative wake up

K. Postanesthesia care/respiratory therapy

30% **IV. Advanced principles of anesthesia**

A. Surgical procedures and procedures related to organ systems

1. Intra-abdominal
   a. Gall bladder
   b. Liver
   C. Pancreas
   d. Spleen
   e. Stomach
   f. Renal/Adrenal
   g. Diaphragm
   h. Laparoscopy
   i. Intestine
   j. Herniorrhaphy
   k. Bladder
   I. Abdominal/Gyn
   m. Prostate

2. Extrathoracic
   a. Breast biopsy
   b. Mastectomy
   c. Plastic and/or reconstructive
   d. Mediastinoscopy/open lung biopsy

3. Extremities
   a. Lower
   b. Upper
   c. Total joint replacements

4. Genital and urologic
   a. Penis/testes
   b. Transurethral resection
   c. Cystoscopy
   d. D and C
   e. Vaginal hysterectomy

5. Head
   a. Extracranial
      (1) Cranioplasty
      (2) Rhizotomy
      (3) Ear
      (4) Eye
      (5) Face
      (6) Nose

b. Intracranial
   (1) Decompression (Burr holes)
   (2) Space-occupying lesion
   (3) Vascular
   (4) Transphenoidal
   (5) CSF shunts

c. Oropharyngeal
   (1) Endoscopy
   (2) Fractures
   (3) Tonsils and adenoids/Peritonsilar abscess
   (4) Orthodontic/Dental
   (5) Pharynx
   (6) Reconstructive and/or plastic

6. Intrathoracic
   a. Heart
   b. Lung
   C. Mediastinum
   d. Diaphragm
   e. Esophagus
   f. Thoraco-abdominal

7. Neck
   a. Larynx/Trachea
   b. Parathyroid/Thyroid
   c. Radical neck
   d. Neck tumors
   e. Plastic procedures

8. Neuroskeletal
   a. Laminectomy
   b. Cervical spine
   c. Fusions
   d. Spinal cord procedures
   e. Surgical sympathectomy

9. Vascular
   a. Carotid
   b. Thoracic
   c. Abdominal
   d. Upper extremity
   e. Lower extremity
   f. Porto-systemic shunts

g. Renal artery

10. Diagnostic/therapeutic
    a. Venous/arterial catheterization
    b. Cardioversion
    c. CTscan
    d. MRI
    e. Electroconvulsive therapy
    f. Echocardiography

11. Management of complications

12. Other
    a. Trauma
    b. Burns
    c. Critical care support
    d. Pacemakers
    e. Lithotripsy
    f. Organ transplants (donor/recipient)
    g. Laser

B. Pediatrics

1. Anatomy, physiology, pathophysiology

2. Pharmacology

3. Anesthesia techniques/procedures

4. Management of complications

C. Obstetrics

1. Anatomy, physiology, pathophysiology

2. Pharmacology

3. Anesthesia techniques/procedures

4. Management of complications

D. Geriatrics
1. Anatomy, physiology, pathophysiology
2. Pharmacology
3. Anesthesia techniques/procedures

4. Management of complications

4% **V. Professional issues**

A. Legal
B. Quality improvement
C. Safety standards (Professional and Organizational)

C. Letter Requesting Contact Person for Anatomy and Cell Biology Coordinators

Graduate School of Nursing
Department of Nurse Anesthesia
(301)295-6565 (Voice)
(301)295-1994 (Fax)

Mr. Gas Man, CRNA
University of Anesthesia
115 Forane Road
Dreamland, USA

Date

Dear Mr. Gas Man:

I am the course director for both Anatomy/Cell Biology and Neuroscience I and II in the Nurse Anesthesia Department at the Uniformed Services University of the Health Sciences. In the near future, a general questionnaire will be sent to interested centers training nurse anesthetists in these two areas of study. This general questionnaire will assess such items as contact hours, teaching methodology, faculty involvement, etc.

Please identify the contact person below who is responsible for these courses for future correspondence.

I am thanking you in advance for this valuable information.

Sincerely,

D.D. Rigamonti, Ph.D

Neuroscience, Neurology Coordinator

Name:
Address:

Fax:
E-mail Address:

Anatomy Cell Biology Regional Anesthesia Coordinator

Name:
Address:

Fax:
E-mail Address:

D. Content Validity Review

Date

Dear _____,

Attached is a copy of my questionnaire and instruction letter I have developed for my thesis entitled "Instructional Methods For Human Anatomy and Cell Biology in Nurse Anesthesia Graduate Programs: A Survey with A Focus on Regional Anesthesia"

Utilizing your expertise in education of nurse anesthesia students and your clinical experience with regional anesthesia please evaluate the questionnaire for the purpose of determining content validity. Your comments and suggestions will be an important contribution to the success of this survey.

Please direct any questions regarding this evaluation to Captain Adrienne Burnette. I may be reached at (301) 572-5912. My mailing address is 12406 Herrington Manor Drive, Silver Spring, MD 20904.

Thank you in advance for your time and effort and prompt completion of your assessment. I would be happy to provide you with a copy of the final tool or information regarding the study.

Adrienne G. Burnette, Capt, USAF, NC
Uniformed Services University of the Health Sciences
Graduate School of Nursing

Instructional Methods For Human Anatomy and Cell Biology In Nurse Anesthesia Graduate Programs: A Survey with a Focus on Regional Anesthesia

Please rate each of the survey questions on how relevant it is to determining the content and teaching methods of Human Anatomy and Cell Biology courses, as well as the relationship of regional anesthesia training to these courses. Use the following scale.

1=Not relevant
2=Somewhat relevant
3=Relevant
4=Very relevant

You may place any comments to the side of your response or in the space provided below.

1._____
2._____
3.a._____
b._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____
11._____
12._____
13._____
14._____
15._____
16._____
17._____
18._____

Please provide any additional comments or suggestions below.

E. Initial Letter to Nurse Anesthesia Anatomy and Cell Biology Coordinators

Graduate School of Nursing
Nurse Anesthesia Department
11426 Rockville Pike Suite 400B
Rockville, MD 20852

Captain A.G. Burnette
Fax: (301) 295 1994
Email: Burnette@usuhsb.usuhs.mil

Date

«Title» «First_Name» «Last_Name» «Degree»
«Address_1»
«Address_2»
«Address_3»
«Address_4»
«Address_5»

Dear «Title» «Last_Name»,

I am currently a Student Registered Nurse Anesthetist (SRNA) at the recently accredited Graduate School of Nursing at the Uniformed Services University of the Health Sciences. My Master's thesis involves describing our Human Anatomy and Cell Biology course with special emphasis on regional anesthesia training. I am interested in how other anesthesia programs instruct their students in these areas. I would be grateful if you would take a few minutes to complete the following questions. I am thanking you in advance for your prompt reply of this valuable information.

Sincerely,

Adrienne G. Burnette, Capt, USAF, NC
Student Registered Nurse Anesthetist

F. Letter Accompanying Questionnaire for Test-Retest Participants

Graduate School of Nursing
Nurse Anesthesia Department
11426 Rockville Pike Suite 400B
Rockville, MD 20852

Captain A.G. Bu
Fax: (301) 295
Email: Burnette@usuhsb.usu

Date

«Title» «First_Name» «Last_Name» «Degree»
«Address_1»
«Address_2»
«Address_3»
«Address_4»
«Address_5»

Dear «Title» «Last_Name»,

Thank-you so much for your prompt reply to my survey on Human Anatomy and Cell Biology with special emphasis on regional anesthesia instruction. I sent the original survey to 23 randomly selected accredited anesthesia schools. I am requesting the first 10 respondents to retake the survey in order to provide supporting evidence for test-retest reliability (the consistency of responses over time).

I know you have an extremely busy schedule, but I would greatly appreciate you retaking the survey for this purpose. Your answers will be used to perfect the survey if necessary, so we can receive the most valuable information. Although you are identified by this researcher as one of the schools used for this purpose, your specific answers will remain confidential and incorporated with the other respondents. Your contribution to this endeavor is greatly appreciated. I am thanking you again in advance for your prompt reply of this valuable information.

Sincerely,

Adrienne G. Burnette, Capt, USAF, NC
Student Registered Nurse Anesthetist

G. Questionnaire sent to Anatomy and Cell Biology Coordinators

Survey For Anatomy Instructors In SRNA Programs

1. Do you currently teach a Human Anatomy course in your anesthesia program? **(If no, skip to question #7)**
   1= Yes 2= No
2. If yes, what books do you use?_____

3. How many contact hours is the course? _____
   a. Number of hours/week spent in lecture? _____
   b. Number of hours/week spent in lab? _____

4. Who teaches the Anatomy course? **(Circle all that are appropriate)**
   1= anatomist (basic scientist)
   2=anesthesiologist
   3=CRNA
   4=biologist
   5=nurse
   6= other (describe)_____
5. What is the faculty to student ratio for lecture?_____
6. What is the faculty to student ratio for lab? _____
7. Do you use human cadavers in your program? **(If no, skip to question #12)**
   1=Yes hours per week?_____ 2=No

8. If yes, do you use
   1=Prosected specimens
   2=Dissection of specimens
   3=Both

9. Are procedures such as regional anesthesia demonstrated on the cadavers?
   1=Yes 2=No

10. If yes, circle the following blocks that are demonstrated. For those blocks that are demonstrated, indicate the amount of class time devoted to the demonstration. Please indicate time in hours or minutes.

Blocks	hours	minutes
1=epidural block	_____	_____
2=spinal block	_____	_____
3=caudal block	_____	_____
4=brachial plexus block	_____	_____
5=digital nerve blocks	_____	_____
6= intercostal nerve blocks	_____	_____
7=individual nerve blocks	_____	_____
8=lumbar plexus block	_____	_____

9=ankle block
10=retrobulbar block
11=paravertebral block
12=other_____

11. Of the blocks demonstrated, do the students have the opportunity to practice the blocks on the cadavers? Circle all blocks that apply and indicate time allowed.

Blocks	hours	minutes
1=epidural block		
2=spinal block		
3=caudal block		
4=brachial plexus block		
5=digital nerve blocks		
6= intercostal nerve blocks		
7=individual nerve blocks		
8=lumbar plexus block		
9=ankle block		
10=retrobulbar block		
11=paravertebral block		
12=other_____		

12. If no, how is regional anesthesia technique demonstrated? (**Cirlcle all that apply**)
1=clinical setting (watching other practioners)
2= using models
3= using books
4=didactic only
5=regional anesthesia is not taught

13. On a scale of 1-7 please rate how important you feel a "three dimensional view" via a dissected or prosected cadaver is to the performance of regional anesthesia. (**Circle the number on the following scale**).

Not important at all----------extremely important
1 2 3 4 5 6 7

14. Do you use computer assisted instruction (CAI) in your anatomy course to demonstrate regional anesthesia techniques?
1=yes 2=no

15. If yes, which blocks are demonstrated? (**Circle all that apply**).
1=epidural block

2=spinal block
3=caudal block
4=brachial plexus block
5=digital nerve blocks
6= intercostal nerve blocks
7=individual nerve blocks
8=lumbar plexus block
9=ankle block
10=retrobulbar block
11=paravertebral block
12=other_____

16. Do you believe that it is important to teach SRNA's regional anesthesia techniques and expect a certain level of competency for graduation? (**Circle the number on the following scale**).

Not important at all----------extremely important
1 2 3 4 5 6 7

17. Are you comfortable with your own ability to perform regional anesthesia techniques?
1=yes 2=no

18. Please provide any comments you feel would be useful to more complete information on this subject.

_____

_____

_____

H. Internal Review Board (IRB) Approval Letter

Date

Dear Lt. Colonel McCreary,

My name is Capt Adrienne Burnette and I am doing my Master's thesis on "Instructional Methods for Human Anatomy and Cell Biology in Nurse Anesthesia Graduate Programs: A Survey with a Focus on Regional Anesthesia". My study consists of sending surveys to the various coordinators of the Anatomy courses at the different accredited anesthesia schools. There will be no patient or hospital involvement. We are essentially collecting descriptive data on how the different schools instruct their students in this area of study.

I am enclosing a copy of the survey and a sample letter that will go out to the various coordinators, as well as a copy of my proposal. I was informed because of the nature of my study, it did not need to go through an IRB board. Please review to see if I need to have this accomplished (I was also told I may require the expedited version of the IRB).

My USUHS box # is 845. I can also be reached at (301) 572-5912. Thank-you very much for you time.

Sincerely,

Adrienne G. Burnette, Capt, USAF, NC
Student Registered Nurse Anesthetist

Date

MEMORANDUM FOR ADRIENNE BURNETTE, GRADUATE SCHOOL OF NURSING

SUBJECT: IRB Approval of Protocol T06127-01 for Human Subject Use

Your research protocol entitled *"Instructional Methods for Human Anatomy and Cell Biology in Nurse Anesthesia Programs: A Survey with a Focus on Regional Anesthesia,"* was reviewed and approved for execution on 3/6/97 as an exempt human subject use study under the provisions of 32 CFR 219.101 (b)(4). Survey to obtain nonsensitive information in which there will be no identifiers linking the responses of the target group to the respondents.

Please notify this office of any amendments you wish to propose and of any untoward incidents which may occur in the conduct of this project. If you have any questions regarding human volunteers, please call me at 301-295-3303.

Michael J. McCreery, Ph.D.
LTC, MS, USA
Director, Research Programs and
Executive Secretary, IRB

Cc:
Chairperson, IRB
Director, Grants Administration
Vice President for Research